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Production Betterment by Time Studies

Instances Showing How So-called Differential Time Observations Have Developed Improvements in Plant Operation, Equipment and Arrangement

BY N. E. ADAMSON, JR.

In a previous article dealing with time study observations which appeared in *The Iron Age* of November 16, 1911, the author showed the various types of observations and described the method of obtaining them. As stated therein, short observations are divided into three types, any one of which is adapted to timing any process, the type to be used being determined by the nature of the information desired.

Type A was described as being one where the starting and stopping time and the number of units performed are recorded. From this information the unit direct labor cost is calculated. This type is used for two purposes, viz., when only rough information is wanted before a complete time study is made of the operation, and when the efficiency of an operation or operator is wanted after a complete time study has been made of the operation. No attempt is made to show how the time is expended nor the method by which the operation was performed.

Type B was one where the operation divided itself into elementary movements. The stop watch was started at the beginning of the first movement and was read at the end of each movement, the watch being run throughout the observation. Deductions from this observation showed the unit direct labor cost, and also the method used. It is useful to a limited extent in deducting losses of time, due to evils which usually can be corrected.

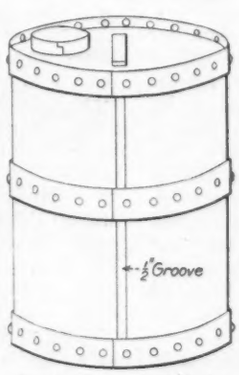


Fig. 1—The 10-gal. Paint Drum

Type C was the differential type. By use of it the manufacture of an article can be thoroughly investigated, for it shows all that the above types show and in addition it can be successfully used in determining which of the two apparently equally good methods is the better. It is apparent that in order to fully standardize the manufacture of an article each operation should be investigated by making observations of type C.

The object of this paper is to show how these observations are grouped in order that they may become useful and to describe the various steps to standardize the manufacture of an article.

First, it is necessary for the observer to be familiar with the successive steps of the manufacture from the time the raw material is first handled until the finished product is ready to leave the shop. It is not essential that he be a skilled mechanic in the trade, but the more he knows about the trade which he is observing, other conditions being equal, certainly the more valuable will be the observation. There must be co-operation between the foreman of the shop and the observer. The foreman often can furnish an outline of the manufacture which is quite helpful in the preliminary study. This outline can be more clearly described if a definite manufacture is considered, and the author again discusses the manufacture of a galvanized iron 10-gal. paint drum.

Standard Operations for 10-Gal. Paint Drum Taken from Book of Standards.

Operation No.	Operation	Machine No.	Pay per Diem.	Stand. Unit Cost.	Stand. Output per Hour.	Description of the Best Method.
A–7	Rivet Collars.....	....	2.00	0.001695	147	Stack on bench in front of operator, strike rivet one blow, rivet set one blow. Drop in receptacle to left.
B–1	Shear Handles.....	58–44	3.04 1.76	0.000375	1600	Shear from binders. Place binders on truck behind operators. Each operator handles two strips, cutting four handles off at one time. Let handles drop to floor behind machine. Move man pick up and place in truck.
B–2	Punch Handles.....	58–93	2.00	0.00033	758	Place truck with handles to be punched to left of operator Remove hand full and place one on each end of machine. Punch both ends of two handles at one time.
B–3	Forming Handles.....	58–27	2.00	0.000312	800	Place truck containing handles to be punched on the left of operator. About 15 are picked up at one time and one placed on each end of machine. Drop formed handles in a receptacle on operator's right.
C–1	Shearing Tops and Bottoms	58–3	1.76 2.00	0.000742	634	Assistant stands behind machine. Pile stock on bench behind machine perpendicular to blade. Adjust gauge for assistant to feed to, so that operator will receive sheet at a point where he can conveniently grasp the sheet. Stack blanks on machine until all of one sheet is cut. While assistant is placing new sheet, operator will remove blanks to truck.

From Fig. 1 it is apparent that the drum consists of several parts. Each of these parts must be manufactured before they can enter into the construction of the whole. These parts are: A, collar; B, handle; C, top and bottom; D, bands; E, body.

The collars are made from the scraps left after the body, top, bottom and center bands have been cut from a

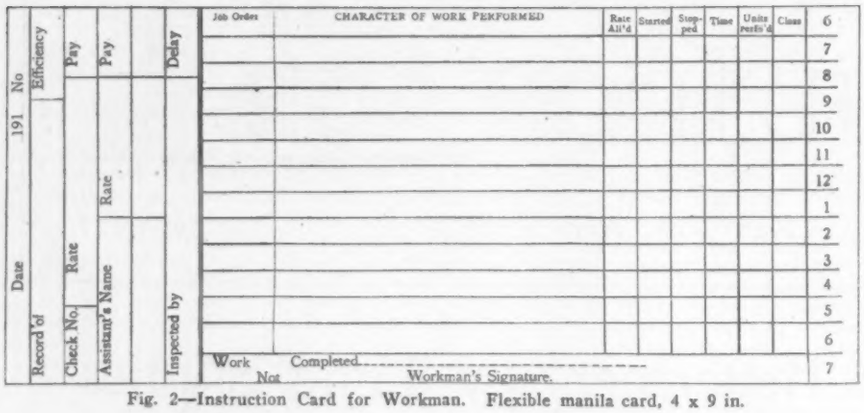


Fig. 2—Instruction Card for Workman. Flexible manila card, 4 x 9 in.

36 x 96-in. sheet. As this scrap comes out in a desirable shape, it is not necessary to trim it before entering it in the press which stamps out the collar. It may be, therefore, said that the first operation on collars is "Punching out Collars," and this operation is designated as operation A-1. The next operation, A-2, is punching collars in a gang punch. The following operations are: A-3, turning edge on collar; A-4, cutting wire for collar; A-5, wiring collar; A-6, forming up collar; A-7, riveting collar.

When the seven operations have been performed, the collar is ready to enter the construction of the drum. The handles are made from binding strips which hold the sheets of metal together when they are shipped from the sheet metal manufacturer. It takes only three operations to make the handle. They are:

B-1, cutting the handles in square shears; B-2, punching handles; B-3, forming handles.

The first three operations of group C are the same for both tops and bottoms. Beginning with C-4 and ending with C-11. The operations apply to the tops only, for the bottom is complete after C-3. The group of operations is:

C-1, cutting out tops and bottoms in square shears; C-2, cutting out tops and bottoms in circular shears; C-3, turning flange on tops and bottoms in press; C-4, cutting holes for collars; C-5, flanging holes for collars; C-6, enter collar in hole; C-7, punching holes around collar and flange; C-8, riveting in collar; C-9, punching tops for handles; C-10, riveting on handles; C-11, soldering around collars and rivets of handles. Thus we see that collars and handles enter into the construction of the drum by first becoming a part of the top.

In like manner, group D is divided into eight operations and group E into 17. There are 46 separate operations in the manufacture of a drum and each of these operations receives careful study. Probably the first question to consider is, "Isn't there a better method than the one pursued?" This question was asked on operation A-1, and was profitably answered. When time study began on drums, the collars were cut out on slitting shears. It was necessary to scrive around a pattern, and after the collar had passed through the shears a notch was cut out of one corner with snips. Now one stroke of the press takes the place of the three former operations. The question was asked concerning operation A-3, and now, instead of the slow process of knocking the edge over by hand, a machine does the work neater and faster. Operations C-4 and C-5 should be combined by having both performed at the same time, using, of course, a special punch and die.

Having made such changes, the next step is to determine what elementary movements are unproductive and can be eliminated. This is where the observation of type C becomes useful. An excellent punch and die had been installed to punch out collars, and apparently everything ran satisfactorily, but observation showed an occasional elementary movement of "knocking off scrap." There was no stripper and the scrap would follow the punch and had to be pried off. A single stripper was attached and now the duration of every movement of the operator is almost constant. Many think that any foreman should see the necessity of a stripper without having to see an observation card. Our foreman saw it, but when he saw the amount in cash that the absence of a stripper was costing he didn't delay getting a stripper.

Interesting methods were adopted during the accumulation of the first set of standards for this article. Operation D-7, the forming of top and bottom bands is performed on 6 ft. power rolls. Because of the fact that the top and bottom bands are punched alike, that is, with the same setting of the gang punch, it is necessary that the top band be formed the reverse of the bottom band. This is done by laying two bands one on the other, having the burred sides turned out, and passing them through the rolls in this relative position. The method the operator chose was to pick up two bands, place them on each other, start them in the rolls, wait for them to come around, and then take them out and throw them aside. The observation card showed that the time consumed in waiting for the bands to come through was in excess of the time required to pick up the bands, to start them in the rolls, to take them out and throw them aside. This showed that there was time for the operator to start in two more bands while the first two were coming through.

The new method caused the operator to have to work faster, and for that reason was detrimental. Working at this speed and having to remove the bands at exactly the right time increased the danger of the operator's fingers being caught between the rolls, therefore the helper, who in the above two methods was employed in arranging the bands so as to be easily reached by operator, was called on to remove bands from the machine while the operator started them in. By this method the whole length of the rolls was utilized instead of only 2 in., as in method No. 2. The direct labor cost per band in the three methods was: First method, $0.00093; second method, $0.00057; third method, $0.000328.

Special attention is paid to the placing of material to be worked at a position which the operator can most easily and speedily reach. The disposition of material after an operation also receives consideration. The use of flat and box trucks has in most cases given satisfaction because it elevates the material so that the operator does not have to stoop, and it affords a means of transportation from one operator to the next. In a shop where 1000 drums were being constructed at one time, one man was sufficient to keep the material moving from operator to operator.

Together with the consideration of the best method of performing an operation should be the consideration of the advisability of purchasing more efficient machines and the changing of the old machines to increase the output. Operation E-16 is soldering drums. At first, ordinary soldering irons were used, while the drum rested on a flat

JOB ORDER..... **SHOP OBSERVATION CARD** DATE.....

CHARACTER OF WORK.....

WORKMAN RATE	OPERATION	DESCRIPTION OF OPERATIONS	1	2	3	4	5
STARTED TO SET MAC.	A						
MACHINE ALL SET AT	B						
BEGAN WORK	C						
	D						
	E						
COMPLETED WORK	F						
REMARKS	G						
	H						
	I						
	J						
	K						
	L						
	M						

Fig. 3—Original Type of Shop Observation Card. White, 4 x 9 in.

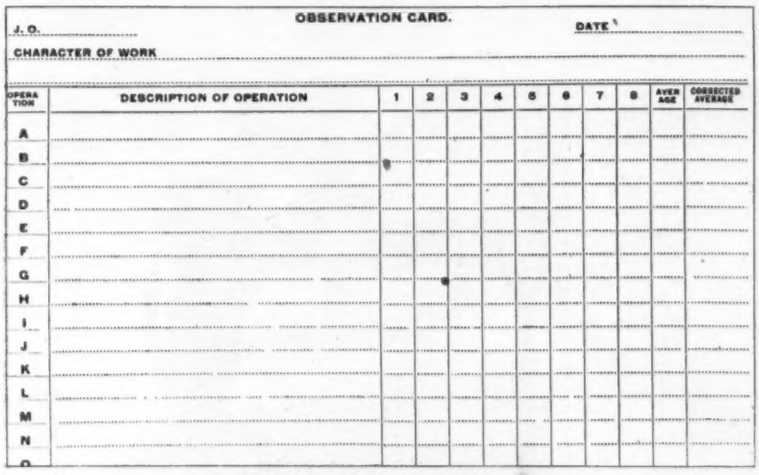
bench. Now a much heavier iron is used having a curved nose to correspond with the curvature of the flange around the top and bottom where the solder is applied. At a small cost adjustable stands were constructed from iron pipe to carry the drum while being soldered. The drum allows the stand to be revolved while the solder is applied and also allows it to be swung end for end, so that either end of drum may be presented to the operator in its best working position. Because of this equipment the solderers have been able to create a standard output of 131/5 per hour per man and to maintain an efficiency of between 90 and 95 per cent.

Operation C-2 is the cutting out of tops and bottoms on circular shears. Formerly the speed of the cutters was 6.18 r.p.m. It took an average of 23.01 sec. actual cutting time for the cutters to cut out one disk. The efficiency of the cutters was then 93.8 per cent. The speed of the cutters was increased to 11.78 r.p.m., and as a result it takes an average of 13.87 sec. actual cutting time to cut out one disk, and the efficiency of the cutters is advanced to 99.08 per cent. Thus the coefficient of slip between the cutters and metal was decreased 85.3 per cent., while the cutting time was decreased 39.8 per cent., and the standard output per hour increased from 96 to 160. As the only element of the operation affected is that of cutting time, during which time the operator was idle, the change does not work a hardship on the operator. All his elementary movements consume the same length of time as before, but his output has been greatly increased.

The last consideration is that of the arrangement of machine tools about the shop. Some claim that in a shop doing miscellaneous repair work together with manufacturing articles, such as herein described, the machines should be arranged to suit the manufacturing industry, while others claim that machines performing similar operations should be grouped together. Probably the greatest factor to decide this is investigation along this line. "What percentage of all the work done is straight manufacturing?" and "Does the manufacturer of one article or one set of similar articles constitute the bulk of the work done by the shop?"

If the manufacture of one article or set of similar articles is performed on a large enough scale to receive consideration in the arrangement of machine tools, unless there is great objection due to the manufacture of various other articles, the machine tools used in manufacturing the popular article should be so arranged that the operations will proceed in a general direction through the shop. If there is doubt as to whether this condition holds in the manufacture of an article, it would be well to get a sketch of the shop showing the arrangement of machine tools. Draw on this sketch a line from the door where the raw material enters the shop to the location of its stowage. Draw a second line from the stowage to the machine on which the first operation is performed, and continue to draw straight lines from operation to operation until the exit door of the finished product is reached. This sketch may now show long lines intersecting and running the whole length or half the length of the shop. Each long line not only means an increased cost of transportation, but it also means a congesting of work in the shop due to trucks having to stop along their passage in order to clear away materials for passage room. It would be well to get such sketches for various articles manufactured in the shops and thus use good judgment in the arrangement of the machine tools. Almost invariably the necessity of two conditions will be shown; first, all raw material should enter at one door; second, the stowage of the raw material should be near that door.

After all operations have been studied and a standard set on each, the information gained from the observations should be compiled in a book form. The character of information given in the book is indicated by the tabulation on page 835. A copy of the book is placed in the hands of the foreman and disposition made of other copies as seen fit. The observation cards are retained for reference in case of doubt as to the correctness of the book. On the flyleaf of the book issued on paint drum manufacture is printed the following:


OBSERVATION CARD.

J. O. _____ DATE _____

CHARACTER OF WORK _____

OPERATION	DESCRIPTION OF OPERATION	1	2	3	4	5	6	7	8	AVERAGE	CORRECTED AVERAGE
A											
B											
C											
D											
E											
F											
G											
H											
I											
J											
K											
L											
M											
N											
O											

Fig. 4—New Observation Card. White, 5 x 8 in.

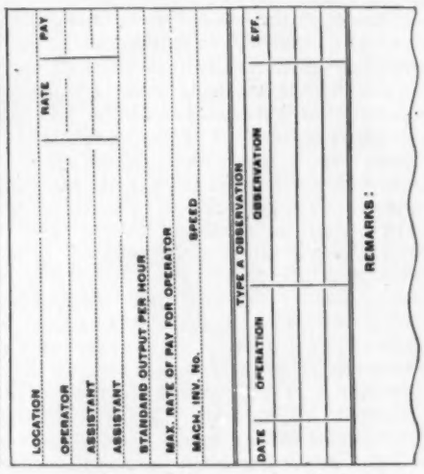


Fig. 5—Reverse of New Card

Instructions for Manufacturing 10-Gallon Paint Drums

Note; Each operation is given a number. This number should be written on the instruction card by the leading men —also the operation.

Machine No. indicates the proper machine to use.

Pay per diem indicates the maximum pay the operator should receive for the various operations.

Standard output per hour is the number of operations the workman should perform per hour.

Leadingmen will see that material is kept moving and not allow machines to become crowded. One or two helpers should be detailed to keep operators supplied with material and to remove same from operators, way when completed. The instructions contained herein will be followed in detail.

Instruction cards, Fig. 2, are then issued to the men employed on the work. The card when issued has the man's name, check number, rate, pay, assistant's name (if there is one), operation number, operation, standard output per hour, and instructions filled in by the leadingmen. The operator fills in under character of work performed, starting time, stopping time, and units performed. In event of a delay during his work between starting and stopping time, he will make an entry of the delay. Along the end of the card is a column of hours. Whenever a leadingman inspects the work of an operator, he punches the operator's card at the hour of such inspection. The punches of the leadingmen are different, so that the leadingman making the inspection is shown by the shape of the hole punched. At the close of each day the instruction cards are dropped in a box by the men as they pass out of the shop. These records are gathered and an efficiency is entered on each, the delays in each case being deducted from the total time before the efficiency is calculated. A slide rule is used to compute efficiencies.

These efficiencies are then entered on a man's efficiency record form on which the efficiency for each day during a month is kept. An average efficiency is determined every two weeks. In event a man's efficiency is exceptionally high or exceptionally low, he is so notified on a form signed by the foreman, which emphasizes that a continuance of such records will result in advancement or reduction, as the case may be. These efficiency records are valuable when it is necessary to reduce the force or when considering raising or reducing a man's pay.

A low efficiency is a signal to the foreman to investigate. A low efficiency on "Drilling around tops and bottoms" was investigated and it was found that the operator had only one twist drill. When that drill became dull it was taken out, and, because there were no facilities at that time in the shop for grinding drills, he took the drill over to a friend in a neighboring shop about 300 yd. away, and this friend, without authority, quit his work and ground the drill.

The method of manufacturing an article is in a continual state of evolution. Competition demands that no effort be spared in reducing cost. A standard set to-day may be out of date a month or a week hence, because of a new method, a new machine, or a change in the design of the article. At this writing there are three changes being considered, viz.: 1—Omission of the center band; 2—Change in the design of the collar and a change in the method of fastening it to the top; 3—Substitution of spot welding (by electricity) for riveting.

As changes are made in the equipment for doing work in a shop so that the work will be done better and quicker, so are changes made in the equipment of the time study man. Fig. 3 shows the original type of time card. It was designed to meet the general need, but was especially adapted to the recording of observations in a machine shop. The use of the card soon proved it to be inadequate to general need. First it was possible to enter the time of only three complete operations, because columns 4 and 5 were used for "average" and "corrected average" respectively. In short observations no record is entered of the time required to set a machine, for, as a general rule in a manufacture of a type like the one here described, the operator does not set his machine. This is done by a higher-priced mechanic, and a separate time record is kept of this just as though it were a separate operation.

The new observation card is shown in Fig. 4. After the standard output per hour has been established by a type C observation, the card is filed. The first division of the file is the shop; second division is the article; third division is the part and the fourth division is the operation number. A comparison of the two cards will show the numerous advantages of the new card over the old. In event the efficiency of a certain operation or the efficiency of an operation with materials in a different position other than the standard position is obtained, such information can be recorded under type A observations and the necessary remarks explaining this new method entered under "remarks." In this way the card can be kept up to date. Should an operator find some more efficient method than the standard method, the high efficiency (probably over 100 per cent.) will be a signal again to set a standard using the new and more efficient method. In this way every operator performing that operation will be using the new and more efficient method.

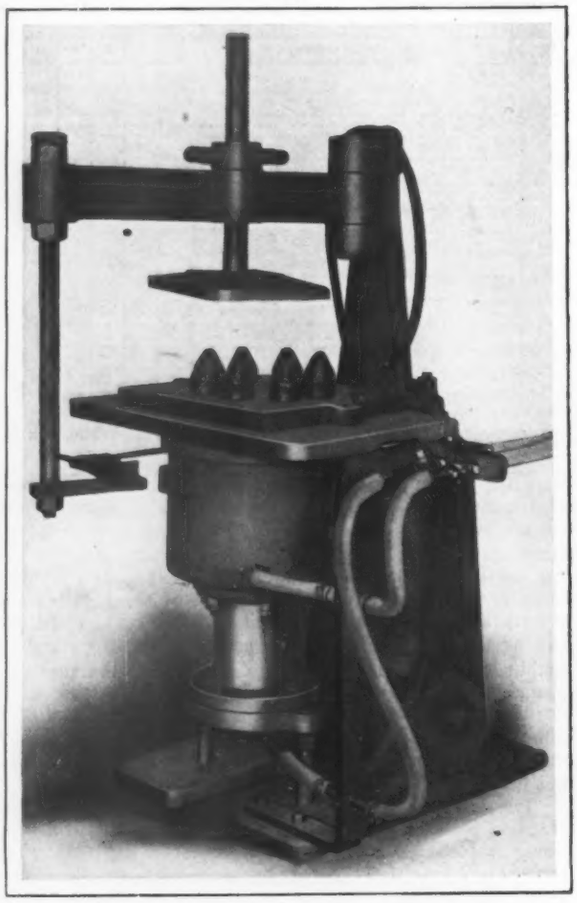
In the last ten months there have been approximately 20,000 drums of this type manufactured in the shop with which the writer is connected. The direct labor cost per drum for the first 1000 was $0.466, while the cost per drum of the last 1000 is about $0.31. At this rate there will be a saving of $3,750 per annum. This is the saving on only one article in a shop which pays its employees on a per diem basis and where the only incentive to increase the output is a desire for a high efficiency. It is believed that this cost can be still further reduced, even while paying on a per diem basis. In this study no reference has been made to the saving due to careful selecting of the sizes of sheets of galvanized iron nor to the economic use of material due to the arrangement of patterns on the sheet.

Efforts are made to work no hardship on the operators. The standards are set by observing men working at a normal speed. The efficiencies of employees sometimes are in excess of 100 per cent. due to "speeding up." When investigation shows that the high efficiency is due to speeding up, the standard is not changed. An efficiency of 60 per cent. on such operations as laying off work, punching bands or cutting out tops and bottoms, where the bulk of the time is consumed by manual and not machine work, is considered good. The reduction of direct labor cost is accomplished by adopting more efficient machines and more efficient methods.

It is believed that the foregoing detailed explanation of the differential time study will be particularly valuable by way of suggestion to works managers.

Combination Molding Machine

A new jar ramming and squeezing and molding machine has been designed by J. N. Battenfeld and is being placed on the market by the U. S. Molding Machine Company, Cleveland, Ohio, which he has recently organized. The special feature of this machine is that, apart from the simplicity of its construction, there are no valves in the cylinder. The jarring cylinder at the bottom of the machine serves two purposes, since it acts as a cylinder for jarring and also for a guide for the large plunger for squeezing. The use of the small cylinder for jarring is said to result in a very marked reduction in the air consumption. Only two valves for controlling the supply of air are employed, these being the inlet valves for the jarring and the squeezing cylinders. There are two hose attachments, one for jarring and the other for ramming.



A New Jar Ramming, Squeezing and Molding Machine Built by the U. S. Molding Machine Company, Cleveland, Ohio.

In the accompanying engraving the machine is shown with the pattern plate and the pattern on the table. When the molder shovels sand into the flask the jarring cylinder is started, and by the time the flask is filled the ramming is practically completed and the flask is ready for the bottom board. At this time the bottom board is put on and the head is swung around and the mold is squeezed. If desired the ramming head can be set only ½ in. above the bottom board. The length of the squeezer stroke is 6 in. and that of the jarring stroke is regulated by the amount of air admitted.

W. P. Snyder & Co., Shenango Furnace Company, Shenango Steamship Company and Shenango Steamship & Transportation Company announce the opening, March 15, of their Cleveland offices at 1612 Rockefeller Building. They are represented by Claude J. Peck.

It cost the Government $1,931,208 more to build the battleship Florida at a Government yard than it cost to have the battleship Utah built by the New York Shipbuilding Company. The Utah complete cost the Government $7,768,118, and the Florida, including equipage, $8,527,325.

A New Internal Grinding Machine

A Brown & Sharpe Model Adapted for a Wide Range of Straight and Taper Work

The No. 22 internal grinder which has been brought out by the Brown & Sharpe Mfg. Company, Providence, R. I., is particularly adapted for grinding holes in hardened steel gears, cutters, collets, bushings and similar work. It is designed to handle all varieties of work within its range that can be revolved, the swing being 18 in. Holes from 2½ to 12 in. in diameter and 8 in. deep can be ground with the regular equipment, and with a special spindle holes less than 2½ in. in diameter, but not exceeding 12 in. in depth, can be produced. Taper work can be done as easily and accurately as straight, and such work as the facing of recesses in automobile gears to obtain a bearing true with the hole can be done without removing the piece from the machine. The various parts are so designed and constructed that great accuracy may be secured, and efficiency and convenience are conspicuous features. Front and rear views of the machine are given in Figs. 1 and 2 respectively.

The work to be ground is fastened either in a chuck or on a face plate mounted upon the work spindle, which is driven from an overhead countershaft. The headstock carrying the work spindle is fastened to the table of the machine, which has an automatic reversing longitudinal movement similar to that of universal and plain grinding machines. Bolted to the right end of the machine bed is a heavy bridge of metal and upon this the grinding wheel stand and the slide are located. The grinding wheel spindle is driven by a web belt from an intermediate shaft at the back of the wheel stand, this shaft in turn being belted to the overhead countershaft.

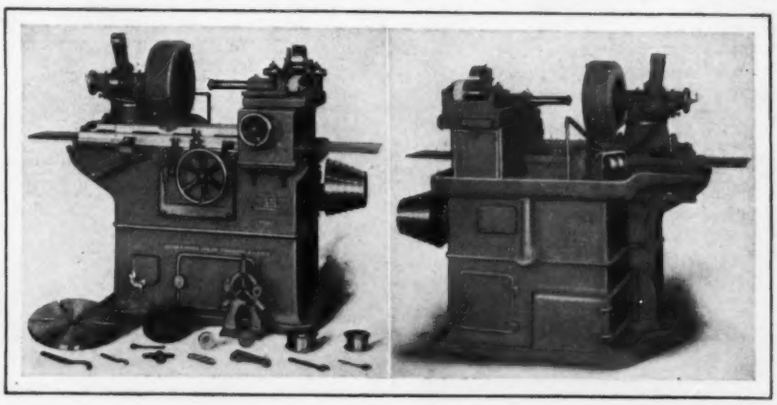


Fig. 1—Front View Fig. 2—Rear View

Two Views of the New No. 22 Internal Grinding Machine Built by the Brown & Sharpe Mfg. Company, Providence, R. I.

Like the builder's universal and plain grinders, the work speeds and the table feeds are completely separated. This arrangement, it is emphasized, constitutes an important factor in commercial grinding, since it is possible to obtain a correct table feed for any work speed. When it is desired to remove stock rapidly a slow speed and fast feed are available. Both work and table feeds are controlled by a single lever located on the front of the machine.

The wheel spindle is of hardened tool steel and is inclosed in a heavy sleeve that extends practically its full length. The spindle and the sleeve together form an integral part which can be easily and quickly removed and another smaller one substituted. In the sleeve at the front end of the spindle adjacent to the wheel is a phosphor bronze box and at the pulley end an annular ball bearing is provided to take the pull of the belt and reduce friction. The different grinding wheels used are mounted upon a sleeve having a tapered hole which fits the end of the spindle. Interchangeable split pulleys on the intermediate shaft at the back of the wheelshaft provide for a wide range of independent spindle speeds. The regular equipment of the machine includes three pulleys, providing for speeds ranging from 3990 to 7300 r.p.m. To provide an even tension on the belt and take up the slack due to the use of pulleys of different diameters an idler pulley is employed.

The wheel stand and the slide are both of heavy, rigid construction, an arrangement which enables them to resist the vibration that might produce inaccuracy in the work. The wheel stand swivels, permitting the spindle to be set at an angle when grinding the face of cutters or automobile gears. When a hole has been ground and it is desired to grind the face of the work before removing it from the machine this feature will also be found convenient. The wheel stand slideways are long to insure correct alignment and are of ample proportions to resist vibration. A transverse movement of the slide is secured through a worm and worm wheel actuated by a hand wheel on the front of the machine. An automatic cross-feeding mechanism similar to that found on all the Brown & Sharpe universal and plain grinding machines can be furnished if desired.

The headstock, which is of rigid design, is firmly fastened to the swivel table by bolts sliding in a T-slot. It swivels and can be set at any angle, the amount being indicated on the graduated dial on the base. The hollow spindle runs in bronze boxes having means to compensate for wear, and it can be locked in position when removing the face plate, chuck or an attachment. Over the pulley is shown the belt-tightening device, which consists of a small pulley mounted on a bracket that can be thrown forward or pushed back by manipulating a handle. When drawn forward tension is brought upon the belt, causing the spindle to revolve and drive the work, and when pushed back the spindle can be quickly brought to a stop or easily revolved by hand when centering a piece. A range of 12 work speeds varying from 40 to 340 r.p.m. is provided.

The sliding table is of rigid construction with bearings scraped to fit the ways in the top of the bed, which are aligned with master straight edges. The table travel is automatic and entirely independent of the work and wheel speeds. It is controlled by adjustable dogs on the front of the table which operate against the reversing lever. These can be raised and the table run beyond the reversing point without disturbing their adjustment, and this feature will be found convenient when withdrawing the work from the wheel. When the work is completed the trip dog nearest the wheel is raised and the table moves to the left until the power feed is automatically disengaged. The table can then be moved farther away by manipulating the large hand wheel. After a new piece of work is put in, the table is moved up by the hand wheel until the work nearly reaches the wheel, at which time the power feed automatically re-engages.

If desired, the machine can also be used for wet grinding, the soda water being pumped from a tank located in the bed and fed to the wheel through the hollow work spindle. This pump consists of a simple fan revolving in a case, and since it is immersed at all times, no packing is required. The tank is readily accessible for cleaning, and the hood or water guard shown on the machine covers the work.

All the wearing surfaces are protected from grit, the ways of the bed are always covered and the oil holes are protected. All the screws, bolts and nuts requiring frequent adjustment are hardened. The hand wheels and levers for controlling the various movement of the machine are all placed at the front. In other details the construction of this machine differs but little from that of the company's universal grinding machine. The swivel table, however, pivots on a stud located beneath the headstock, making a long leverage from that point to the end and permitting very fine adjustments in setting to grind straight work and in bringing a taper to the exact angle after the headstock has been set as closely as possible by the graduations on its base. The equipment furnished with the machine is shown on the floor in Fig. 1, and an overhead countershaft which is not shown is also furnished.

Six changes of table feed varying from 15 to 48 in. per minute are available for any work speed.

The furnace of the Pulaski Iron Company, Pulaski, Va., has been blown out for relining. It will be blown in again in about two weeks.

Automatic Blast Furnace Charging

Controller Eliminating Personal Equation in the Proper Manipulation of the Charging Bells and Rotary Distributor of the Burden

BY DAVID BAKER

The best devices for filling a blast furnace mechanically fail entirely if the operator does not maintain the proper sequence in the movement of the appliances for distributing the stock on top of the furnace and in the operation of the bells.

The following account of an actual experience with one of the best equipped and most modern stacks of Eastern Pennsylvania will illustrate. This furnace had been working irregularly for some time and the management was unable to locate the cause of the trouble, although they felt convinced it had some connection with the operation of the skip hoist and top. This condition of affairs continued for some time, until one day a furnace manager from another state called at the plant and, in discussing furnace problems and practice, was told of the trouble this furnace was giving at that time. At noon the visiting manager refused luncheon, saying he would look about the plant until the superintendent returned. While walking about the yard the visitor took a seat where he could observe the operation of the hoist and soon noticed that the skip operator lowered the small bell just before the skip dumped, instead of just after the load was discharged from the skip. When the furnace manager returned he was told how the skip and top were being operated and he at once corrected the trouble by requiring the skip operator to wait until the skip dumped before moving the lever

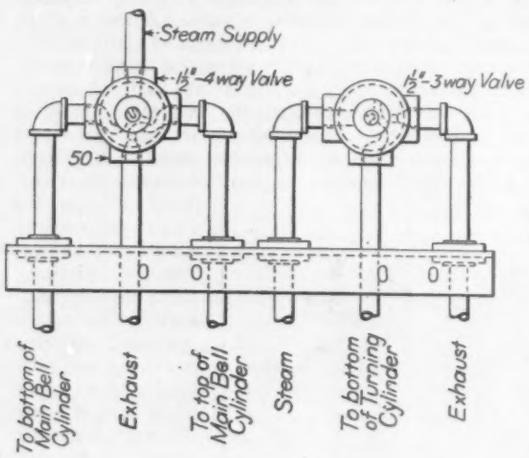
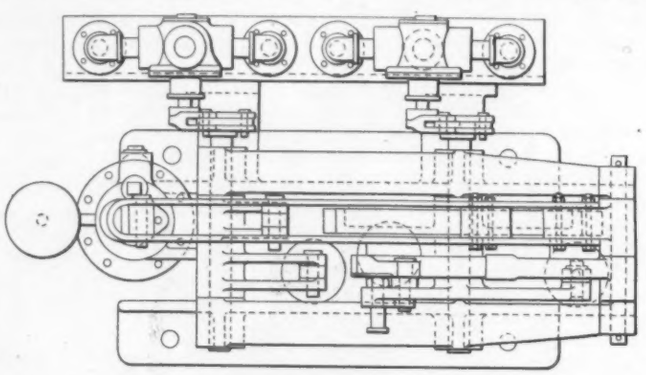
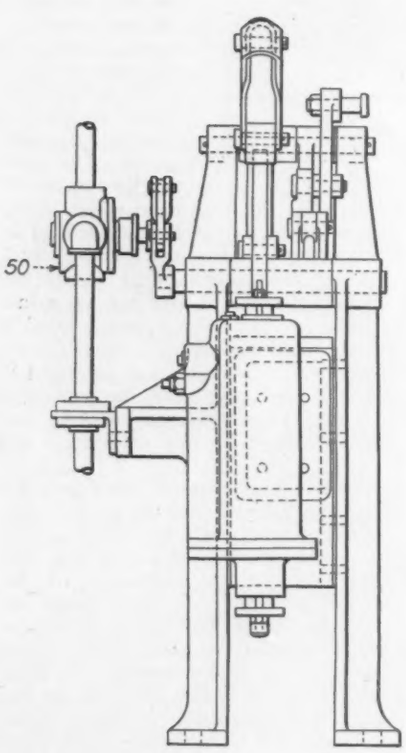


Fig. 3—Elevation of Control Valves
Fig. 2—Side Elevation of Controller





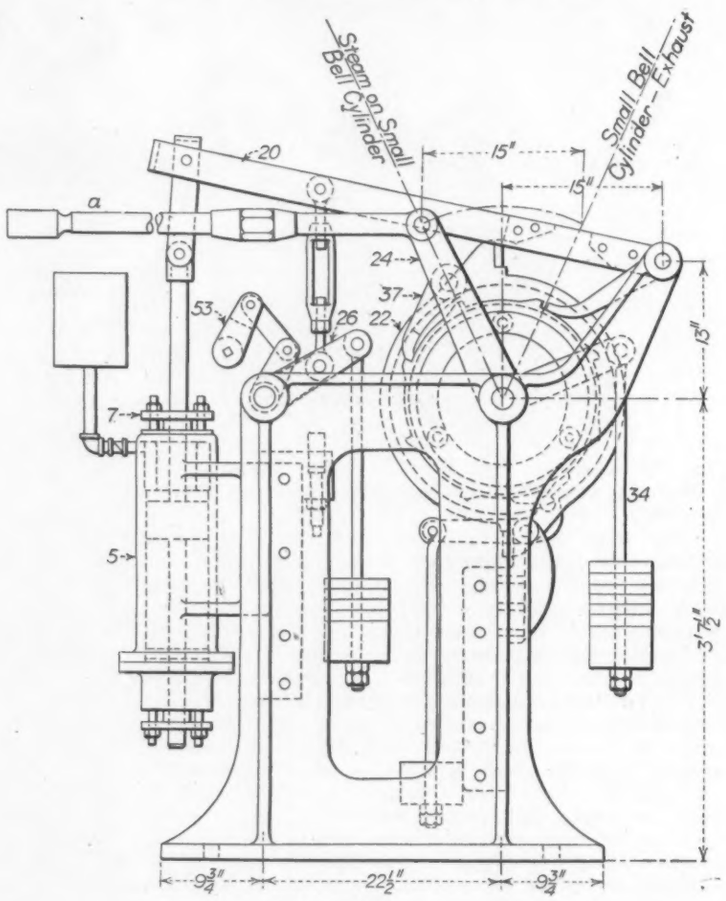


Fig. 4—Plan of the Controller
Fig. 1—Front Elevation of the Controller

BAKER MECHANICAL CONTROLLER FOR AUTOMATIC OPERATION OF BLAST FURNACE CHARGING APPARATUS

to dump the bell. The instructions to this operator had been made correctly, but the man, in order to expedite matters, thought he was not doing anything wrong by lowering the bell while the skip was hoisting. Within 24 hr. from the time the error in filling was corrected the furnace settled down to regular work.

The story just related describes only one of the many mistakes that may be made willfully or ignorantly in the operation of the skip hoist. A common error is irregular lowering of the main bell. Occasionally a green operator will forget to lower the main bell until both hoppers are choked with stock, and he is made aware of his negligence by the rattling of stock falling on the cast house roof.

There is another feature of the operation of the main bell that has an important bearing on the distribution of the stock in the furnace, and that is the speed of opening this bell when loaded with stock. If this bell is opened rapidly the stock has more impact against the wall, and there is more sorting of the lumps and fines, the lumps rebounding farther than when the bell is opened slower, and hence more lumps are thrown away from the walls.

When a mechanically filled furnace is equipped with a rotary distributor, some means is necessary to insure the proper sequence of operations of every part of the top, and where the movement of the distributor is dependent on the skip operator at the foot of the hoist some form of recorder is frequently installed that will give a record of the movement of the bells and distributor on a sealed chart that is changed every 24 hr. This would seem to furnish a perfect check on all the operations of the top mechanism, but that even this safeguard is not sufficient to secure uniform sequence of operation may be shown by the following experience at a large southern plant.

At this plant a common form of rotary hopper distributor was used, propelled by an electric motor, and of course it required more time to revolve this hopper when it was loaded with its ore charge than when running light. This fact the skip operator soon discovered, and found he could save time in filling the furnace by opening the small bell first and revolving the hopper afterwards empty, thus getting the records on the recording gauges all right and saving time in charging the furnace. His whole idea was to fill the furnace quickly and have more frequent periods for resting. This trick of the operator was not discovered until it had been in practice some months and not until disastrous effects had been produced in all of the furnaces. These two examples from actual practice only illustrate what happens frequently enough to cause severe losses in the operation of blast furnaces and great anxiety to the management.

In order to reduce the opportunities of mistakes in filling the blast furnace mechanically and to rob the operator of the temptation to deceive, the writer was convinced some time ago that these operations should be performed automatically, and, with that in view, designed the mechanical operator or controller to be described. With this controller the furnace manager fixes the cycle of operations for the top mechanism, and the skip operator has simply to start the skip, attend to the sounding rod or stock indicator and the oiling; the movement of the bells and distributor are performed automatically. This controller was designed for and is used with furnaces equipped with single skip hoists and the Baker-Neumann rotary distributors, but it is applicable to any other top distributor not operated by the movement of the skip.

The controller is attached to the hoist engine. For this purpose the Otis Elevator Company equips its steam or electric hoists with its old form of automatic stop, where the screw feeds a nut with a lug back and forward, dependent on which way the hoist is running. This nut and lug come in contact with a corresponding lug on a lever arm when the skip reaches the bottom. The Otis Company usually attaches this mechanism to the outside of the drum shaft. This lever arm just described is attached to the controller by means of a connecting rod, with ball and socket connection at each end.

In Fig. 1 is shown a front elevation of the controller. In this *a* is the connection to the automatic attachment on the hoist engine. The drawing shows the position of the lever 24 attached to the automatic on engine when the skip is at the bottom of the hoist. Lever 24 operates, through pawl 37, the cam plate 22; the cam plate 22 operates lever 20, which is attached to lever 26, and operates lever 53, connected to valve 50, shown in Fig. 2, a side elevation of the controller. Lever 20 is controlled in its downward movement by the oil controlling cylinder 5.

The cam plate 22 is loose on its shaft, but the lever 24 is keyed to the same shaft, which is connected to the three-way valve shown in the elevation of the valves, Fig. 3, and in the plan of controller, Fig. 4.

The counterweight 34 is heavy enough to return lever 24 to its starting point as soon as the hoist engine has raised the skip out of the pit, and the automatic on the engine has released the connecting rod *a*. In the same way the counterweight attached to the lever 26 returns that lever and valve attached to starting point as fast as the oil in the cylinder 5 can pass through the by-pass of that cylinder.

Operation of Controller

Just as the skip car is coming to rest at the bottom of the skip pit the automatic attachment on the hoist engine pulls lever 24 in position, shown in Fig. 1, and the cam plate with it. This cam plate is laid out with as many notches between the cams for pawl 37 as there are to be skips of coke to the charge.

Ordinarily the coke is hoisted in four skips and the ore and stone in four skips. It is customary to put the stone first in each ore skip, thus giving good distribution and keeping the skip clean in dumping. In Fig. 1 the cam plate is divided into four notches, so that after the four skips of coke are hoisted the cam raises lever 20 as the empty skip car passes into the pit to receive the ore and stone.

Retracing our steps in this description a little, each time a skip of coke starts out of the pit, lever arm 24 is pulled back by the counterweight 34 to its starting point, thus operating the three-way valve at the right of Fig. 3 and opening the gas seal bell and lowering the distributor in position. Every time the skip returns to the pit empty arm 24 is pulled into the position shown in Fig. 1 and the cam plate is rotated one notch. This is done four times, giving a complete ring of coke on the bell when the fourth skip is dumped.

At this point, when the coke is all on the main bell and the skip car has returned empty to the starting point, the three-way valve is thrown, the gas seal bell is closed, and just as the gas seal bell closes after four skips of coke have been dumped on the main bell the cam plate throws up the lever 20 and operates the four-way valve controlling the main bell to give a quick opening of the bell, but the closing is made slowly on account of the retarding oil cylinder 5.

Underneath the cam plate will be noticed a brake operated by a counterweight. This is to prevent the cam plate from working back when it is released by lever 24 and pawl 37 at the return of the empty skip to the pit.

It will be noted that every time the skip returns to the pit steam is turned on the small bell cylinder, so that the top is sealed, and as the distributing plate of the Baker-Neumann top is attached to this gas seal bell it is rotated automatically as this bell closes, thus setting the distributor at the same time in the right position for receiving the stock for the next skip car that dumps.

The cycle of bell and distributor operations is maintained at all times the same, without regard to the honesty of the skip operator. The controller is now in use at several furnace plants and working very satisfactorily. It is protected by letters patent.

The General Electric Company, Schenectady, N. Y., reports interesting sales of centrifugal air compressors. A 100 hp. set has been sold to the LaClede Gas Light Company, St. Louis, Mo., for blowing a water gas generator. Other sets, varying from 10 to 50 hp., were sold for use in connection with oil-burning furnaces as follows: Two to the Michigan Smelting & Refining Company, Detroit, Mich. (repeat order); one to Warren Tool & Forge Company, Warren, Pa.; one to Vermont Car Company, Mt. Vernon, Ill. (repeat order); one to Cleveland Metal Products Company, Cleveland, Ohio. For use with pneumatic ash conveyor systems, one set each to S. D. Warren Company, Cumberland Mills, N. C.; Government Railways, New South Wales; Peoples Power Company, Moline, Ill.

Turbo Compressors in Practical Service

Commercial Promise of Turbo Blowers and Compressors—Efficiency of Different Installations and Drives Including the Exhaust Steam Turbine

More than a decade ago Prof. A. Rateau, of Paris, first attracted the attention of the mechanical and metallurgical world with his practical experiments in the design of turbo compressors and blowers, and since that time both he and others have done much original work in this field. But not until within the past few years have their efforts been crowned with commercial success. At the present time there are in satisfactory service abroad (and to a limited extent in this country) several hundred such units, ranging from small blowers used for cupolas and shop compressors of moderate capacity to heavy blowers furnishing the blast for ore furnaces and compressors of the largest sizes for mine service. With it all very little information of a definite character has thus far been published on the subject.

The advantages claimed for turbo compressors and blowers which have thus far been very well substantiated in service, may be summarized as follows:

(1) Greatly decreased weight and smaller floor space occupied, as compared with piston machines.
(2) Simpler and less expensive foundations, owing to the absence of all shocks or knocking.
(3) There are no valves, reciprocating parts or rubbing surfaces, and no opportunity of friction except at the bearings. The impellers revolve freely within the cylinder and the unit, as a whole, is not subject to the wear or deterioration of the piston type.
(4) Very low consumption of oil, etc.; lubrication is required only at the bearings.
(5) Attention reduced to a veritable minimum.
(6) Flexibility of operation to suit the varying requirements of a pneumatic system or of blowing service.
(7) Ready adaptability to automatic control in respect to constant volume or constant pressure of the delivered air with varying pressure and varying volume, respectively.
(8) Delivery of air to pneumatic service or blowing system in a steady stream of constant or varying volume, as required, instead of in puffs as with a piston compressor.
(9) Efficiency maintained within a few per cent. of its high full-load value over a wide range of output.
(10) No drop in efficiency with lengthening service, and, if a turbine is used as the prime mover, no increase in steam consumption to still further lower the efficiency of the complete unit.
(11) Lower cost of units for the larger capacities, as compared with reciprocating and less expensive buildings.
(12) Can be driven by motors or by high pressure or exhaust steam turbine, in the last named instance affording an excellent means of utilizing exhaust from hoisting or rolling mill engines usually run non-condensing, as well as from other reciprocating units conveniently located.
(13) Are adapted to all classes of service, as in mining work for the operation of pneumatic drills, cutters, etc., in blowing heating furnaces and cupolas, blast furnaces and converters, or in shop service for supplying air to pneumatic tools.

Efficiency of the Turbo Compressor

Concerning the efficiency of turbo as compared with piston compressors there has been a great deal of controversy abroad. It is claimed for the former that efficiencies of 65 to 69 per cent. have been obtained, and one test case mentioned in this article gave 67½ to 68 per cent. but all of the figures thus far published appear to have been for very large units, both steam turbine and motor-driven, and there are very little reliable data. On the other hand the figures for piston compressors are almost equally scarce and, where the latter are driven by reciprocating engines, the engine losses have seldom been separated from the compressor loses. It would seem as though there were a good opportunity, at the present stage of development, to make accurate comparisons between piston compressors, engine driven, and turbo-compressors, steam turbine driven, by computations made in pounds of steam per isothermic air horse-power or per pound of free air delivered, and the efficiency calculated as thermo-dynamic efficiency or ratio of power needed to compress the air isothermically to that theoretically obtainable from the steam in expanding from the initial to the final pressures. It is only in this way that a parallel can be drawn between the two types of compressor units and will also enable them to be compared, in turn, with electric motor driven compressors; for the figures can then be referred directly to power plant costs and the total investment in equipment. The method is advocated by V. Oswald Davis, and some interesting facts concerning means of arriving at compressor efficiencies were given by him, in an article written for the A.E.G. Journal for November, published by the Allgemeine Elektricitäts Gesellschaft, Berlin.

Conceding that, in point of efficiency, the piston compressor has the advantage, precisely as the piston or plunger pump outranks the centrifugal, the numerous other advantages of turbo-compressors, as enumerated above, show that there are still strong arguments to be adduced for their use.

Question of Motor Drive for Turbo Compressors

When it comes to the question of motor drive there are also differences of opinion, according to varying experience. It appears, however, to have been pretty well demonstrated that, except for low pressures and small capacities or high pressures and large capacities, with favoring power conditions, electric drive is less efficient for either compressors or blowers than steam operation by means of a turbine direct coupled. The resultant economy is not only higher, but the regulation of the suction and discharge is much simpler and can be effected over a wider range. There is also the point in favor of this combination of turbine and turbo-compressor that the efficiency of each is best developed under similar conditions. With motor drive the disadvantages are chiefly due to the fact that the unit ordinarily runs at constant speed, with regulation of the air supply by unloading or throttling. Such methods are never entirely effective. Considerably more favorable are the conditions with direct steam drive which, with a suitable governing device, enables a constant pressure to be maintained in the supply mains, within wide fluctuations of service, by merely varying the speed of the turbine and therefore that of the compressor. Other factors connected with power generation and distribution may, however, outweigh these advantages in favor of motor drive; so that the entire question can only be decided after a thorough study of the local situation.

Those who are particularly interested in the use of turbo-blowers for blast furnaces will find an excellent paper on this subject in the March, 1911, issue of the Journal of the American Society of Mechanical Engineers, by Richard H. Rice, of West Lynn, Mass. This describes installations of six-stage General Electric turbo compressors driven by steam turbines at the works of the Empire Iron & Steel Company and the Northern Iron Company. An illustrated article in this connection has also appeared in *The Iron Age*. Mr. Rice gives details of their operation, makes comparisons with two reciprocating blowing engines previously used, and gives the conclusions he reached. Similar conclusions, with respect to blowers for forge or foundry work and similar service are reached in a paper by the same author read before the American Foundrymen's Association, Pittsburgh, Pa., in May, 1911.

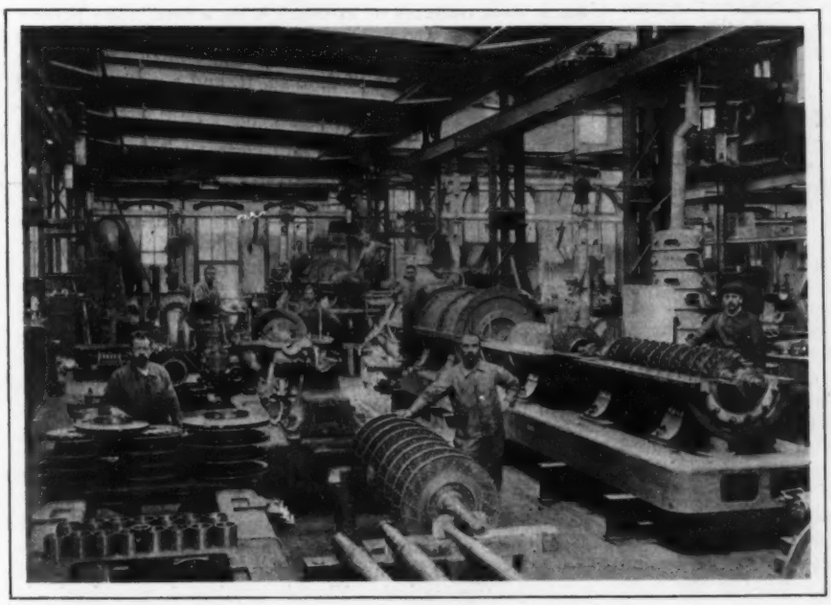
Another valuable contribution on turbo blowers applied to blast furnace work is an article by Prof. A. Rateau describing an 1800-hp. blower installed at Vizcaya, Spain, running 1700 r.p.m. and delivering 38,000 cu. ft. per minute, at 7.7 lb. pressure. This, so far as the writer is aware, has not appeared outside of the Zeitschrift Oesterreichische Ingenieur, published at Vienna.

One advantage in the use of turbo as compared with piston compressors, frequently overlooked, is the great saving in oil. Not only is this beneficial from the viewpoint of maintenance costs but it also eliminates the risk of explosives in the air receiver and piping due to ignition of low flash point oil by any undue rise of temperature. A notable example of such an explosion is the one which took place at the Clifton Colliery, in England, some years ago.

An electrically driven turbo blower which the writer saw in the shops of Pokorny & Wittekind, at Frankfurt-am-Main and is mentioned here as one of moderate size, was designed to deliver 6000 cu. ft. per minute against a pressure of 27 lb. absolute. It included four impeller wheels, in a single cylinder, with buckets of nickel steel.

Turbo compressors built by the Gutehoffnungshütte, Oberhausen, for the Rand Mines, have a delivery together of about 22,000 cu. ft. per minute at 170 lb. pressure. Each was arranged to be driven by a synchronous motor of 2000 hp. running 3000 r.p.m. One of these compressors contains 8 and the other 14 impeller wheels. They are of the Rateau type.

Pokorny & Wittekind built for the Victoria Falls & Transvaal Power Company, Ltd., Johannesburg, to be installed in the same district, a three-stage turbo compressor, with a rated capacity of 20,000 to 24,000 cu. ft. per minute at 135 lb. pressure and a speed of 3000 r.p.m. This had four cylinders, two for the low pressure, one for the intermediate and one for the high pressure stage, with a total of 15 impellers. For driving it two synchronous motors of 5000-hp. combined capacity were direct coupled, all of the machines being mounted in one base. At the official test run the compressor delivered upward of 22,000 cu. ft. per minute, with compression from 0.83 to 9.9 atmospheres. The power consumption averaged 4080 hp. and the unit reached the high efficiency of 67.5 per cent. referred to isothermic compression. Approximately the same figures were also attained by the Rateau turbo compressors previously referred to, built in Oberhausen, and by units constructed for the Rand Mines by the Allgemeine Elektricitäts Gesellschaft.



Turbo Compressors Being Assembled in the Works of Brown-Boveri & Co., Baden, Switzerland; the Machine on the Right has 29 Impeller Stages in Three Cylinders and Represents About 4000 hp. on the Prime Mover

Another notable development is the use of rotating instead of fixed diffuser vanes in turbo-blowers built by the Rudolph Meyer A.G., Mulheim, with what is claimed to be a material gain in efficiency. A large machine of this type, designed by Prof. J. Novak of Prague, Austria, was exhibited at the Brussels Exposition. It was described in Power, in the issue of September 5, 1911.

In his work on "The Evolution of the Parsons Steam Turbine," recently published, Alex. Richardson gives some valuable data, including figures of steam consumption, on turbo compressors and blowers of large and moderate capacities. One turbine-driven blower for the copper smelting furnaces of the Mt. Lyell Mining Company in Tasmania, built by C. A. Parsons & Co., required only 5980 lb. of steam per hour when delivering 18,000 cu. ft. of free air per minute against 7-in. pressure, which is equal to 255 adiabatic horse-power. Steam superheated 70 deg. Fahr. was supplied at 140-lb. pressure per square inch, the vacuum maintained by the condensing system being 27 in., referred to a 30-in. barometer. The result gives a steam consumption per adiabatic horse-power hour of 23.5 lb., or an overall thermal efficiency of 34.3 per cent.

In this connection it may be said that the writer was shown by builders on the Continent figures for overall efficiencies on tests as high as 42.2 per cent. These are, however, of little practical interest, as the operating man is chiefly concerned with actual power consumption. Generally speaking, the overall thermo-dynamic efficiency will be greater for small compression units than for large, as a rotating compressor for low air pressure possesses a better isothermic efficiency than one designed for a higher pressure but there are, of course, exceptions.

Driving Compressors by Exhaust Steam Turbines

The use of exhaust steam in turbines driving rotary compressors has also found a place in European practice at mines and metallurgical works. For example, where such exhaust is available in any quantity from intermittently operating hoists or rolling mill engines, or from other reciprocating steam units, this can be effectively done. The first tendency in all such cases was to utilize the steam only in turbines driving electric generators and then to apply the current, through motors, to the operation of other machinery, including compressors. Of late, however, it has been decided at many places abroad to eliminate the unnecessary stages in transformation of the energy and to apply it more directly to compressed air production by its utilization in low or mixed pressure turbines directly coupled to turbo compressors, which arrangement appears to have been satisfactorily accomplished. This also effects a saving in room and simplifies the arrangement of the plant.

A typical installation is that of a turbo compressor driven by a mixed pressure turbine, to the buckets of which live steam is admitted when the supply from the exhaust of the hoists of other units is insufficient. The exhaust steam passes through a regenerator. One example which has attracted considerable attention is that of two steam-turbine driven blowers furnished by Frasers & Chalmers, Ltd., and Brown-Boveri & Co., which were installed for the Bolckow Vaughn Steel Works, Middlesbrough, Eng. These operate on exhaust steam and are reported to have effected a large saving. C. T.

The National Malleable Castings Company states that it has been considering the installation of an electric steel melting furnace in its plant at Sharon, Pa., but has not yet come to a definite decision in the matter.

The Bethlehem Works in Moving Pictures

The Bethlehem Steel Company, South Bethlehem, Pa., will use moving pictures for the purpose of advertising. A few weeks ago the company contracted with the Pathe Frères Moving Picture Company, 42 West Twenty-fifth street, New York, to furnish films showing the processes of conversion of raw materials into finished steel products, including guns, armor plate, armor-piercing projectiles, etc. The proposition required great care, as the operators who took the pictures were obliged to contend with many difficulties, the chief of which was the necessary amount of light for the indoor illustrations. In some of the shops Cooper-Hewitt lights were used, with a 30-in. battleship torch light of 30,000 candle power. Fifteen electricians were constantly engaged making the connections in the various shops to furnish the needed light. Other elements with which the film men had to contend were wind, steam, excessive heat, and, for outdoor work, the severe winter weather.

There are in all 3250 ft. of films, which are shown in four reels. The descriptive matter on the films is printed in English and Spanish, it being the purpose of the Bethlehem Steel Company to send the views to its agents in foreign countries. At a private exhibition of the pictures given to the heads of departments, their ladies and friends, a very able lecture was delivered in connection therewith by Robert M. Bird, superintendent of the tempering plant, who explained the various processes in the course of the conversion of raw materials into finished steel products.

Heating and Ventilating a Large Factory

Large Rubber Factory Heated in Winter and Cooled in Summer by Water Circulated Through Green Fan Blast Heaters

In a number of cases the basis of the design of the power generating equipment of a modern factory is the demand of the plant for heat for raising the temperature of the air in the buildings and also for industrial purposes. If a considerable percentage of exhaust steam can be utilized in heating or in drying coils, or in calendering rolls, dye tubs, evaporators, cooking kettles, vulcanizers, etc., the power is sometimes regarded as a by-product. The cost of the boiler equipment and the expense of fuel would of necessity be involved to supply the demand for heat in any case and the production of power is merely incidental, involving no cost other than that of the engines and generators employed and for the care and attention which they must receive. In many cases no exhaust steam is wasted at any period of the year on account of the great demand for heat, but, on the other hand, the exhaust steam is supplemented with live steam when there is an exceptional demand for heat, as is the case during the winter months. Where the demand for exhaust heat during the winter is about equal to the engine's output there is generally a certain percentage of exhaust steam which must be allowed to escape to the atmosphere or to be condensed in summer. A plant of the latter class is the rubber mill and rubber goods factory of the Lee Tire & Rubber Company, Conshohocken, Pa. Here the demands for heat for warming the buildings and for vulcanizing, drying, etc., are so great that all of the exhaust is consumed during over half of the year and only a small percentage escapes to the atmosphere even in the summer months, when the lighting load is much less.

The heating requirements of this plant are somewhat more exacting than ordinary as the buildings are of reinforced concrete construction with a large proportion of glass in the total wall surface. One of the heaters used to supply warmth to the buildings is illustrated in Fig. 1, while Fig. 2 is a plan of the second floor of one of the buildings, showing the arrangement of the hot-blast heater outfit built by the Green Fuel Economizer Company, Matteawan, N. Y., and the air duct on the second floor. The heater shown in Fig. 1 is located at the right end of Fig. 2.

Fig. 1—One of the Hot Blast Heater Outfits with a Double Discharge Installed by the Green Fuel Economizer Company, Matteawan, N. Y.

Details of the Plant

The plant consists of two buildings, the factory proper and the rubber mill. The former, which is known as the Hector street mill, has a total cubical contents of 1,726,540 cu. ft. and there are 44,300 sq. ft. of glass as compared with 6328 sq. ft. of concrete wall and 29,800 sq. ft. of concrete roof. The rubber mill, which is a much smaller building, has a total length of 330 ft., a width of 82 ft. and two stories, each 14 ft. high, making the total contents 658,560 cu. ft. This building is divided by a fire wall into two parts, and, as will be noticed from Fig. 2, the two portions are unequal and the heating apparatus installed is therefore of different sizes. The right end of the building and the one in which the heater shown in Fig. 1 is installed has a total contents of 416,640 cu. ft., a total glass surface of 11,074 sq. ft. and a total wall surface of 1582 sq. ft. The left end of the building has a cubical contents of 214,920 cu. ft., a glass surface of 6276 sq. ft. and a wall surface of 896 sq. ft. The maximum heat loss for the factory is estimated at 4,605,000 B. t. u. per hour, while the figures for the two parts of the rubber mill were 1,038,000 and 4,067,000 B. t. u. per hour, respectively.

In the case of both buildings the heating and ventilating problems are complicated by the nature of the processes carried on in them. These involve the handling of rubber, dissolved in volatile liquids, which evaporate in large quantities during manufacturing and the subsequent drying processes. For this reason it was considered advisable to change the entire air contents of the main floors of both buildings every 18 min. and in the basements every 22 min. The large four-story Hector street mill is divided in the middle by a fire wall and this reason, among others, led to the installation of two heating equipments. Both of these are exactly alike and consist of a Green hot-blast heater outfit located on the fourth floor and comprising a double discharge full housing fan, a Positiv-flo steam air heater and a horizontal engine. Each heater contains 80,240 lineal feet of 1-in. pipe and the fan delivers 48,900 cu. ft. of air per minute against a pressure of ¾ oz. per square inch. The air is taken from a fresh air connection extending to the roof and is heated to 140 deg. F. However, in very cold weather part of the air may be taken from inside the building and recirculated, the dimensions of the outfit being based on maintaining an interior temperature of 70 deg. F. with zero weather outside and the recirculated air entering the heater at a mean temperature of approximately 50 deg. F. The building is 400 ft. long and 85 ft. wide, each of the four stories being 14 ft. high, and this was another reason for dividing the heating equipment. Even with the double heating plant over 10 tons of galvanized iron was required for the duct work in this building. A large vertical duct leads the air from the fans to the different floors, where horizontal branch ducts run along the ceiling and discharge the air through outlet nozzles on either side against the floor and into the space occupied by the workmen.

As has been already mentioned, the rubber mill is a much smaller building and this is divided by a fire wall into two parts. The amounts of air required by the two portions, based on a complete change every 18 min., are 23,160 cu. ft. and 30,400 cu. ft. per minute, respectively. In the larger portion of the building when exhaust steam is being used in the heater 3850 lineal feet of 1-in. pipe is employed in the heater shown in Fig. 1 for heating the air from 50 to 140 deg. F., which was considered ample to maintain a temperature of 70 deg. F. in zero weather. To heat the air in the other section of the rubber mill a hot-blast heating outfit consisting of a Positiv-flo heater of 2250 lineal feet of 1-in. pipe and a three-quarter housing fan driven by a vertical engine was installed. In this building the galvanized iron work weighed about 3 tons.

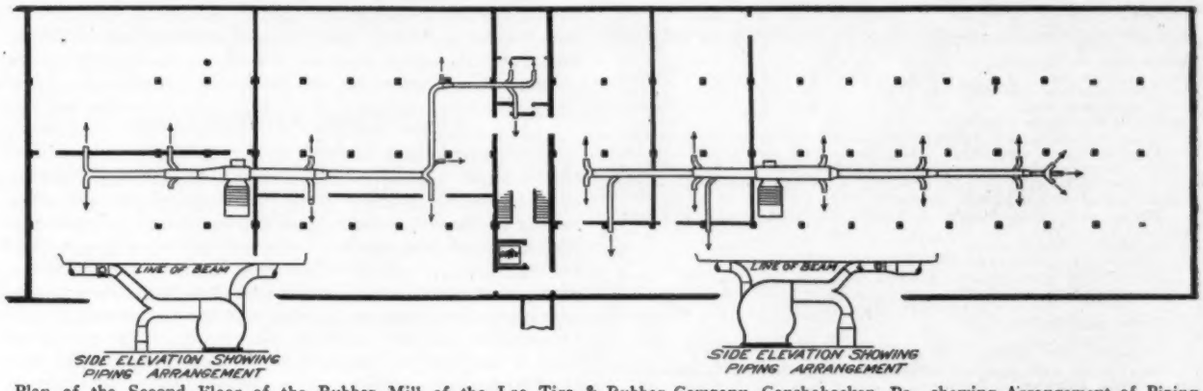
As far as possible all the heating, ventilating and other heat requirements throughout this building are met by the use of exhaust steam, which is supplied by an 18 x 28 x

36-in. cross-compound engine, an air compressor, a boiler-feed pump; a vacuum pump for two dryers, one being employed for drying cloth and the other for rubber; a vacuum pump for the heating system and a 12 x 12-in. engine directly connected to a lighting generator. All the exhaust from these units is collected in one exhaust main which leads to a Cochrane open heater. In the separator of the heater the steam is freed from oil before passing to the exhaust steam distribution system and a reducing valve provides for furnishing live steam when the amount of available exhaust is insufficient. The small engines driving the ventilating fans also exhaust through separators directly into the adjacent hot-blast heaters. Other uses of exhaust steam are to prevent the water in the fire-protection tank from freezing and also for nearby hot beds belonging to the proprietors of the establishment.

Automatic air valves are furnished for almost all of the radiators, calendars, etc., and the air and water are delivered by the vacuum pumps to a tank about 10 ft. above the heater. The hot-blast heaters are located at a sufficient height to return the condensate by gravity, the drop being sufficient to overcome any vacuum which may be carried on the system. It is stated that on account of the careful utilization and conservation of all the water of condensation and the drips from the heating system very little make-up water is required for the operation of the plant, and this is taken from an artesian well. The boiler-feed water after being heated and treated with caustic soda in the feed-water heater is pumped at a temperature corresponding to the back pressure or vacuum in the heater through a Green economizer having 6000 sq. ft. of heating surface into the Heine boilers. The stack of this plant is 150 ft. high, which gives a draft of 2 in. This is sufficient not only for the boilers, but it also disposes of the sulphuric acid fumes from the rubber vulcanizers.

In the summer advantage is taken of the possibility of using the heaters for cooling the air, water from the artesian well being circulated through the tubes of the heater and overflowing into the reservoir. It is pointed out that the Positiv-flo heater is so designed as to be well adapted for this service since the flow is positive from inlet to outlet. The pipes are arranged horizontally between two vertical headers and it is possible to examine the individual tubes and to remove scale or other accumulations from the interior of the pipes after the header covers have been taken off.

It is stated that during the recent exceptionally cold weather the heating of the building was very satisfactory. The plant as a whole was designed by Francis Broadnax, New York City.



Plan of the Second Floor of the Rubber Mill of the Lee Tire & Rubber Company, Conshohocken, Pa., showing Arrangement of Piping and Heaters

On petition of the Chamber of Commerce and the Industrial Bureau of Lockport, N. Y., State Engineer Bensel has issued an order to increase the capacity of the lift bridge to be erected across the enlarged Erie Barge Canal at Chapel street in that city so that freight traffic will be possible over it. The heavier bridge will permit of an industrial switch being built from the Erie and the New York Central lines in East Lockport to mills and factories on the south side of the canal. The building of the industrial switch also assures the location of another large industry which was contingent upon the construction of the heavier bridge.

The Pennsylvania Ore Find

The United States Geological Survey belittles the reported discovery of a billion tons of iron ore in Fulton County, Pennsylvania. A statement issued by the survey says:

The geology of Fulton County is well known from the reports of the State geological surveys, and the impossibility of the case is apparent to anyone who will read these reports and study the maps for a moment. A billion tons of iron ore would occupy a volume nearly equal to the mass of the three "mountains" named, and carbonate of iron when chemically pure contains only 48 per cent of iron and brown ore less than 60 per cent. Nevertheless, to ascertain what might have given rise to the reports, Director Smith, of the United States Geological Survey, sent Geologist George H. Ashley into Fulton County to make an investigation. He reports that undoubtedly these hills contain several million tons of low-grade red iron ore and may contain a small amount of high-grade brown ore and more low-grade brown ore.

Mr. Ashley found that three drill holes have been sunk into a shallow, canoe-shaped basin of red shale forming the Meadow Ground. The basin is readily measured in length, breadth and depth. If all ore, it would hardly contain 30,000,000 tons. The rocks are well exposed and show practically no iron except the iron coloring the rocks. Lowrie's Knob, if a solid hill of ore, would contain only about 100,000,000 tons. The rocks here are likewise well exposed. A pocket of brown ore has been worked out on the east side by the old Hanover furnace yielding about 75,000 tons of ore (46 per cent. iron). The cove fault runs through Lowrie's Knob and Dickey's Mountain, so that the rocks forming them stand on edge and locally are crumpled. Dickey's Mountain contains some low-grade sandy iron ore on the west side, possibly 5,000,000 tons, as the bed cuts off against the fault. A little brown ore, 14 in. by 2 ft. thick (38 per cent. iron) was dug for the Hanover furnace, but abandoned as impossible. The black shales of the Devonian are present in the region, but no suggestion of carbonate ore was seen.

Record Exports of Manufactures.—Manufactures exported in February, 1912, exceeded in value any earlier February, and for eight months ending with February were also greater than in any corresponding eight months. The total value of manufactures exported in February was $82,500,000, against $72,000,000 in February, 1911; $62,000,000 in February, 1910, and $50,000,000 in February, 1909. For eight months ending with February the total was $639,000,000, against $571,000,000 for the corresponding months of 1911, $491,500,000 for the same months of 1910, and $420,000,000 in the corresponding months of 1909. Should the rate of increase over last year's figures reached by eight months ending with February continue, the total value of manufactures exported in the fiscal year ending June 30, 1912, will exceed $1,000,000,000.

The Commonwealth Steel Company, St. Louis, Mo., has filed a certificate in New Jersey increasing its capital stock from $1,500,000 to $2,000,000.

American Society for Testing Materials

Annual Meeting in New York Last Week Contributing to Engineering Progress Thirteen New and Three Revised Iron and Steel Specifications

The annual meeting of the American Society for Testing Materials was not without its dramatic incidents nor did it fail to sustain its enviable record for producing standard specifications. It held a two day meeting in New York City, at the Hotel Astor, March 28 and 29. From a professional standpoint this was limited wholly to the consideration of proposed specifications of various materials, previous arrangement having been made, as mentioned in the report of the Atlantic City meeting last summer, for receiving engineering papers in connection with the International Congress for Testing Materials, to be held in New York in September. Among the specifications ordered sent to the membership for mail voting before they can constitutionally be regarded as adopted were the following:

Stay bolt iron (revised).
Engine bolt iron.
Refined wrought iron bars.
Iron locomotive boiler tubes.
Heat treated carbon-steel axles, shafts and similar objects (revised).
Forged and rolled, forged, or rolled solid steel wheels for engine truck, tender and passenger service.
Forged and rolled, forged, or rolled solid steel wheel for freight car service.
Structural nickel steel.
Automobile carbon and alloy steels.
Open-hearth steel girder and high tee rails.
Steel castings (revised).

Locomotive Materials.

Boiler and firebox steel.
Boiler rivet steel.
Annealed steel forgings.
Lap-welded and seamless steel boiler tubes and safe ends, 2½ in. outside diameter and under.
Steel shapes, universal mill plates and bars.

One of the points over which differences of opinion developed, temporarily checking the generally harmonious acceptance of committee recommendations regarding specifications, was a proposition of Committee A-1, Wm. R. Webster, chairman, to amend the existing standard specifications for steel reinforcing bars so that the last part of Section 1 of those specifications would read: "Bars shall be rolled from new billets. No rerolled material will be accepted." The word "new" is an injection into a sentence now in that section and the second sentence is new. Edward E. Hughes, vice-president of the Franklin Steel Company, Franklin, Pa., and president of the Rail Steel Bar Manufacturers Association, precipitated a vigorous discussion which resulted in a vote to refer the amendment to the membership for the usual letter ballot with a statement that the action is not to be construed as indicating any prejudice against the so-called rerolled material.

Several references were made during the meeting to the seriousness of the steel rail problem, particularly by Dr. Henry M. Howe in his presidential address, and also by Chairman Webster of Committee A-1, which has to do with specifications for steel. The specifications submitted to the meeting for consideration did not cover the steel rail question, but Mr. Webster paid a tribute to the good hands now grappling with the problem, and offered a resolution, as an addendum to the report, to the effect that careful consideration would be given to the revision of the steel rail specifications, with the hope that hearty support of other organizations would be gained.

Standard International Specifications.

Dr. Howe's address, delivered at the opening session on Thursday morning, expressed the belief that a favorable change has been made in the plan to erect standard international specifications. The most important step recommended is the adoption at an early day of standard international specifications, not indirectly through the preliminary development of single national specifications, but directly, for three important classes of materials, structural steel for ships, for bridges, and for buildings. The specifications for structural steel for ships recommended are those now common to the British Engineering Standards Committee and to Lloyd's Register, supplemented by the chemical requirements of the American Society for Testing Materials. For bridge steel the specifications recommended are those of the American Society for Testing Materials, which, as Dr. Howe is credibly informed, are practically identical with those of the American Railway Engineering Association, the affiliations of which give to its specifications an importance of the very highest order. For building steel the specifications recommended are those of the American Society for Testing Materials, which are in general like its bridge steel specifications save that they permit the use of Bessemer steel, and set a higher phosphorus limit.

Dr. Howe said the reception which these propositions have received is very encouraging. American members of the committee of the International Association for Testing Materials which has this matter in charge, have contributed in an important degree to the progress.

Attitude Toward Steel Rail Failures.

The presidential address referred also to the direct and immediate service of the society to mankind through its specifications and outlined four ways of increasing the society's efficiency—through the subdivision of committees; through the work of the committee on style, perfecting the form of, and detecting gaps in specifications; through co-operation of other societies, and through co-operation of the national government, which now has representation on the executive committee. It concluded with a lengthy reference to steel rail failures, in part as follows:

We set up standards for rails. It is strongly suspected and at times asserted that the breakage of these rails causes many needless deaths. If those rails are bought under our specifications, and if those specifications do not fully secure the very least attainable danger of breakage, we, as the experts on whose judgment these rails have been permitted, through their breakage, to kill our fellow men, are in a measure responsible. If the rails which imperil the lives of our fellows are bought not under our specifications but under looser and improper ones, then certain questions loom up. Are we, because of our expert knowledge of the manufacture, testing and uses of rails, in a position to inform ourselves as to whether such specifications fail to protect our fellows thoroughly, and thus actually doom some of them to death? Such insufficient specifications are pistol shots fired indeed into a crowd and aimed at no individual, but none the less carrying death, and carrying it with the knowledge and the permission of those who could prevent it if they would. Has not our voice the power to be heard? Is not our competence to form a true judgment recognized? If yes, if preventable practices are now continuing which are going to kill many men, practices the dangerous nature of which we are in a position to recognize and convincingly to expose; if, under these conditions we omit to exert our power of detection and exposure, shall we not be in a measure responsible for those future deaths, as I am responsible in part for the death of a drowning man to whom I fail to throw the life belt in my hand? Is it not our duty to do overtly what lies in our power to save the lives and protect the bodies of our fellows? To determine what acts would be most effective would require very careful consideration, and a knowledge which I manifestly lack. An offer, a tactfully insistent offer of our aid to the bodies whose legal duty it is to investigate and remove the supposed dangers, is a possible one, perhaps more promising than an independent investigation on our own part.

It is idle to plead that the fault lies primarily elsewhere; that the railroads are in part to blame, and the traveling public in part, because of its inconsiderate demands for unsafe speed. My duty toward the drowning man is unaffected by his having come into the water through his own fault or that of another; it is unlessened by the apathy of the police and of the other onlookers. My duty is my duty. It depends solely on my own conditions and powers, and not on the faults of others.

The question then seems to resolve itself into these. First, is there a considerable number of rail breakages capable of prevention by means of better specifications? Second, can we contribute directly or indirectly toward bettering those specifications by directing attention to their present defects? I commend these questions to your thoughtful consideration.

New Officers and Amendments to By-Laws.

The annual report of the executive committee announced a present membership of 1430, the net gain, since

June, 1911, over losses by death, resignation and non-payment of dues being 48. It recommended changes to the by-laws, which were voted by the meeting for submission to the membership for the usual letter ballot. These provide for the establishment of an honorary grade of membership; for two vice-presidents instead of one; and eight members in addition to the officers to constitute the executive committee. All are to hold office for two years except the president, whose term is one year. One vice-president and four of the eight additional members of the executive committee are to be elected every year.

The result of the election of officers this year resulted as follows:

President: Capt. Robert W. Hunt, Robert W. Hunt & Co., Chicago.

Vice-President: A. W. Gibbs, general superintendent of motive power, Pennsylvania Railroad, Altoona, Pa.

Secretary-Treasurer: Edgar Marburg, professor of civil engineering, University of Pennsylvania, Philadelphia.

Members of Executive Committee: J. B. Lober, president, Vulcanite Portland Cement Company, Philadelphia; A. A. Stevenson, vice-president, Standard Steel Works Company, Philadelphia; S. W. Stratton, director, United States Bureau of Standards, Washington, D. C.

The members of the executive committee who have another year to serve are W. A. Bostwick, vice-president, Orford Copper Company, New York City; Dr. Richard Moldenke, metallurgist, Watchung, N. J., and William R. Webster, civil engineer, Philadelphia. The executive committee, in the event of the probable favorable vote on the by-law amendments, will have to appoint an extra member, only three instead of four being elected this year, in accordance with the present by-laws, and it will have to appoint a member to fill the vacancy caused by the election to the presidency of Captain Hunt, and it will also have to appoint a second vice-president.

The executive committee's report, in mentioning the co-operation with committees of sister societies, like the American Electric Railway Engineering Association and the American Railway Master Mechanic Association, stated that the Bureau of Construction and Repair, U. S. N., and the Bureau of Steam Engineering, U. S. N., have acquired four perpetual memberships in the society, and these bureaus are now directly represented on many of the technical committees.

Standard Specifications for Coke.

In the absence of the chairman of Committee D-6 on standard specifications for coke, Albert Ladd Colby made a statement to the effect that the state of the art is not at present such as to justify submitting specifications for beehive or by-product coke for application to a wide territory as regards coal supply. Much work remains to be done regarding standards of sampling, chemical analysis and physical testing, and the procedure to be taken comprehends the working of a subcommittee with committees of the American Chemical Association and the American Foundrymen's Association.

Specifications for Automobile Steel.

One of the most important proposed specifications offered by Committee A-1 was that covering automobile carbon and alloy steels. It covers eight classes according to chemical composition. They are all tabulated except automobile nickel-vanadium steel, which was not supplied at the meeting. It was voted to refer the specifications to the membership for letter ballot.

Automobile Carbon Steels:

Phosphorus, not over 0.04; sulphur, not over 0.045, and carbon and manganese as here tabulated. All values expressed in per cent.

Carbon		Manganese	
Desired	Permissible Range	Desired	Permissible Range
0.10	0.05—0.15	0.45	0.30—0.60
0.15	0.10—0.20	0.45	0.30—0.60
0.20	0.15—0.25	0.65	0.50—0.80
0.25	0.20—0.30	0.55	0.40—0.70
0.30	0.25—0.35	0.65	0.50—0.80
0.35	0.30—0.40	0.65	0.50—0.80
0.40	0.35—0.45	0.65	0.50—0.80
0.45	0.40—0.50	0.65	0.50—0.80
0.50	0.45—0.55	0.65	0.50—0.80
0.60	0.55—0.70	0.65	0.50—0.80
0.80	0.75—0.90	0.35	0.25—0.50
0.95	0.90—1.05	0.35	0.25—0.50

Automobile carbon steel screw stock: 0.14, carbon (0.08—0.20 permissible range); manganese, 0.55 (0.30—0.80 permissible range); phosphorus, 0.12; sulphur, 0.06—0.12.

Automobile Nickel Steels:

Manganese, 0.65 (0.50—0.80 permissible range); phosphorus, not over 0.04; sulphur, not over 0.04; nickel, 3.5 (3.25—3.75 permissible range), and carbon, as below. All values expressed in per cent.

Desired Carbon	Permissible Range	Desired Carbon	Permissible Range
0.15	0.10—0.20	0.35	0.30—0.40
0.20	0.15—0.25	0.40	0.35—0.45
0.25	0.20—0.30	0.45	0.40—0.50
0.30	0.25—0.35	0.50	0.45—0.55

Automobile Nickel-Chromium Steels with Low Nickel:

Manganese, 0.65 (0.50—0.80 permissible range); phosphorus, not over 0.04; sulphur, not over 0.04; nickel, 1.25 (1.00—1.50 permissible range); chromium, 0.50 (0.30—0.75 permissible range), and carbon as below. All values expressed in per cent.

Desired Carbon	Permissible Range	Desired Carbon	Permissible Range
0.15	0.10—0.20	0.35	0.30—0.40
0.20	0.15—0.25	0.40	0.35—0.45
0.25	0.20—0.30	0.45	0.40—0.50
0.30	0.25—0.35	0.50	0.45—0.55

Automobile Nickel-Chromium Steels with Medium Nickel:

Manganese, 0.45 (0.30—0.60 permissible range); phosphorus, not over 0.04; sulphur, not over 0.04; nickel, 1.75 (1.50—2.00 permissible range); chromium, 1.00 (0.75—1.25 permissible range), and carbon as below. All values expressed in per cent.

Desired Carbon	Permissible Range	Desired Carbon	Permissible Range
0.15	0.10—0.20	0.35	0.30—0.40
0.20	0.15—0.25	0.40	0.35—0.45
0.25	0.20—0.30	0.45	0.40—0.50
0.30	0.25—0.35	0.50	0.45—0.55

Automobile Nickel-Chromium Steels with High Nickel:

Manganese, 0.45 (0.30—0.60 permissible range); phosphorus, not over 0.04; sulphur, not over 0.04; nickel, 3.50 (3.25—3.75 permissible range); chromium, 1.50 (1.25—1.75 permissible range), and carbon as below. All values expressed in per cent.

Desired Carbon	Permissible Range	Desired Carbon	Permissible Range
0.15	0.10—0.20	0.35	0.30—0.40
0.20	0.15—0.25	0.40	0.35—0.45
0.25	0.20—0.30	0.45	0.40—0.50
0.30	0.25—0.35		

Automobile Nickel-Chromium-Vanadium Steels with Low Nickel:

Manganese, 0.65 (0.50—0.80 permissible range); phosphorus, not over 0.04; sulphur, not over 0.04; nickel, 1.25 (1.00—1.50 permissible range); chromium, 0.50 (0.30—0.75 permissible range); vanadium, 0.18 (not under 0.12), and carbon as below. All values expressed in per cent.

Desired Carbon	Permissible Range	Desired Carbon	Permissible Range
0.15	0.10—0.20	0.35	0.30—0.40
0.20	0.15—0.25	0.40	0.35—0.45
0.25	0.20—0.30	0.45	0.40—0.50
0.30	0.25—0.35	0.50	0.45—0.55

Automobile Nickel-Chromium-Vanadium Steels with Medium Nickel:

Manganese, 0.45 (0.30—0.60 permissible range); phosphorus, not over 0.04; sulphur, not over 0.04; nickel, 1.75 (1.50—2.00 permissible range); chromium, 1.00 (0.75—1.25 permissible range); vanadium, 0.18 (not under 0.12), and carbon as below. All values expressed in per cent.

Desired Carbon	Permissible Range	Desired Carbon	Permissible Range
0.15	0.10—0.20	0.35	0.30—0.40
0.20	0.15—0.25	0.40	0.35—0.45
0.25	0.20—0.30	0.45	0.40—0.50
0.30	0.25—0.35	0.50	0.45—0.55

Automobile Chromium Steels:

Manganese, 0.35 (0.20—0.45 permissible range); phosphorus, not over 0.03; sulphur, not over 0.03, and carbon and chromium as below. All values expressed in per cent.

Carbon		Chromium	
Desired	Permissible Range	Desired	Permissible Range
0.95	0.90—1.05	1.00	0.90—1.10
1.20	1.10—1.30	1.00	0.90—1.10
0.95	0.90—1.05	1.20	1.10—1.30
1.20	1.10—1.30	1.20	1.10—1.30

Automobile Chromium-Vanadium Steels:

Phosphorus, not over 0.04; sulphur, not over 0.04; chromium, 0.90 (0.70—1.10 permissible range); vanadium, 0.18 (not under 0.12), and carbon and manganese as below. All values expressed in per cent.

Carbon		Manganese	
Desired	Permissible Range	Desired	Permissible Range
0.15	0.10—0.20	0.65	0.50—0.80
0.20	0.15—0.25	0.65	0.50—0.80
0.25	0.20—0.30	0.65	0.50—0.80
0.30	0.25—0.35	0.65	0.50—0.80
0.35	0.30—0.40	0.65	0.50—0.80
0.40	0.35—0.45	0.65	0.50—0.80
0.45	0.40—0.50	0.65	0.50—0.80
0.50	0.45—0.55	0.65	0.50—0.80
0.95	0.90—1.05	0.35	0.20—0.45

Automobile Silico-Manganese Steel and Valve Metals:

Carbon, desired	0.5	per cent.
Carbon, permissible range	0.45—0.55	"
Manganese, desired	0.65	"
Manganese, permissible range	0.50—0.80	"
Phosphorus, not over	0.04	"
Sulphur, not over	0.04	"
Silicon, desired	1.75	"
Silicon, permissible range	1.50—2.00	"

Valve Metal No. 1 shall be malleable and contain not less than 96 per cent. nickel.

Valve Metal No. 2 shall contain 8 to 35 per cent. nickel and not over 0.5 per cent. carbon; 1.50 per cent. manganese; 0.04 per cent. phosphorus and 0.04 per cent. sulphur.

Rerolled Reinforcing Bars

The proposal to change the present specifications for steel reinforcing bars, so that under these specifications rerolled material cannot be accepted, brought out, as stated, a vigorous protest from President Hughes of the Rail Steel Bar Manufacturers Association, who mentioned that he represented a group of manufacturers producing no less than 200,000 tons of rerolled bars per year. He had no knowledge of a single failure in use, and felt that the proposed specification eliminated rerolled material without its interests having a day in court.

Chairman Webster emphasized that the specifications cover new material and in that respect are in harmony with other specifications of the society, and he mentioned the possible necessity of a definite specification recognizing old rails, as he stated that with the old rails it was not feasible to learn the chemical constituents of the material, and he had records of variations of 50,000 lb. per square inch in the tensile strength. In answer to this statement mention was made of large variation occurring in high carbon ingot steel and that at any rate if the steel was satisfactory for railroad use in the first place, it is certainly good for the later use and, as a matter of fact, has been bettered by the mechanical work done on the metal. Professor Marburg admitted the general understanding that rerolled material is used in large quantities by engineers of ability. He did not regard a given specification as against a material not included in it, and he made a motion, which was carried, that in submitting the amendment for a letter ballot it is to be expressly understood that the action taken is not to be construed as expressing any prejudice against the material mentioned.

Structural Nickel Steel and Girder Rails

Specifications for structural nickel steel were approved for submission to the membership vote. These, with a number of changes consented to by the meeting, are substantially an adaptation of specifications for nickel steel prepared by Boller & Hodge in connection with the design of the municipal bridge across the Mississippi at St. Louis.

Proposed specifications were similarly favorably received for open-hearth steel girder and high tee rails. The steel must conform to either of the following carbon limits: 0.60 to 0.75, or Class A, or 0.70 to 0.85, or Class B, the manganese being 0.60 to 0.90, the silicon, not over 0.20 per cent. and the phosphorus, not over 0.04 per cent. It is specified that the drop testing machine is of the type recommended by the American Railway Engineering Association; that three rails from the top of the ingots shall be selected by the inspector from each heat, from two of which a test specimen not less than 4 nor more than 6 ft. in length shall be cut. The test specimen must be placed head upward on supports 3 ft. apart and shall be subjected to the specified fall of the Standard tup (2,000 lb.) as follows: Rails weighing over 100 lb. per yard and over 7 in. in depth, 15 ft. Class A; 12 ft. Class B; rails weighing 100 lb. or less per yard, or 7 in. or less in depth, 13 ft. fall Class A; 10 ft. Class B.

Revision of Staybolt Iron Specifications

The revision of the specifications covering staybolt iron was reported by S. V. Hunnings, chemist and engineer of tests, American Locomotive Company, Schenectady, N. Y. It was considered advisable to recognize the large percentage of 50,000-lb. 30 per cent. iron used at the present time, but it was felt that it would be well to recommend a specification of a character that the consumers of the 48,000 lb., 28 per cent. iron could adopt without material increase in cost, and that the consumers of the 50,000 lb., 30 per cent. iron could adopt without feeling they were sacrificing quality. The strength, elougation, and reduction of area have been raised slightly over similar requirements in the present specification, but a paragraph is incorporated giving a retest of specimens breaking outside the middle third of the gage length and those developing defects in testing. The revised specifications had provided for vibration tests, but it was agreed that these should be eliminated this year, as more information is needed with regard to the testing machines.

Specifications for Wrought Iron Bars

Specifications covering engine-bolt iron, refined wrought iron bars and iron boiler tubes for locomotives were also provisionally approved for the letter ballot. The physical requirements for the engine-bolt iron are those generally in use. The process of manufacture prohibits the use of iron scrap or steel in the manufacture of this material; local mill crop ends are not considered scrap. The committee felt that as this iron is used extensively for case-hardened and finished bolts, where the quality of the work depends largely upon the uniformity of the material, such material should be made exclusively from newly puddled iron. This specification includes a section covering an etch test to determine whether the process of manufacture described has been observed.

The specification for refined wrought-iron bars covers a grade of iron suitable for general forging, smithing and construction purposes. Some of the tests required are the following:

Cold-bend Tests.—The test specimen shall bend cold through 180 deg. without fracture on the outside of the bent portion, as follows: For round bars less than 2 sq. in. in section, around a pin the diameter of which is equal to the diameter of the specimen; for round bars 2 sq. in. or over in section and for all flat bars, around a pin the diameter of which is equal to twice the diameter or thickness of the specimen.

Hot-bed Tests.—The test specimen, when heated to a temperature between 1700 and 1800 deg. F., shall bend through 180 deg. without fracture on the outside of the bent portion, as follows: For round bars less than 2 sq. in. in section, flat on itself; for round bars 2 sq. in. or over in section and for all flat bars, around a pin the diameter of which is equal to the diameter or thickness of the specimen.

Nick-bend Tests.—The test specimen, when nicked 25 per cent. around for round bars, and along one side for flat bars, with a tool having a 60-deg. cutting edge, to a depth of not less than 8 nor more than 16 per cent. of the diameter or thickness of the specimen, and broken, shall not show more than 10 per cent. of the fractured surface to be crystalline.

Specifications for Locomotive Materials

Favorable consideration was given to specifications for locomotive boiler and firebox steel, boiler rivet steel and lap-welded and seamless steel boiler tubes and safe ends. An illuminating point was brought out regarding the scope of the specifications. J. O. Leech, inspection department of the Carnegie Steel Company, suggested that the phosphorus limitation should be 0.045 rather than 0.04, as there had been an elimination of the 12½ per cent. allowable variation. James H. Gibboney, chief chemist, Norfolk & Western Railroad, expressed the belief that there were few railroad specifications covering rivet steel or steel rivets and that such steel is bought on a 0.04 rejection limit without apparently working any hardships. H. E. Smith, chemist, Lake Shore & Michigan Southern Railroad, Cleveland, said the 0.04 limit was not exceeded when the rivet material was bought to no specification. Mr. Leech emphasized that specifications are written from records of tests and that one doubtless has little idea how many heats may be rejected in meeting the specification and that a hardship may be placed on the mill without good reason.

Specifications for rolled steel wheels, for both passenger and freight service, were approved, the changes including a reduction of the carbon range to 0.20 and of the manganese range to 0.25, with the silicon 0.15 to 0.35 per cent. for acid and 0.10 to 0.30 per cent. for basic steel.

Heat-Treated Carbon Steel Axles and Shafts

The changes in the specifications for heat-treated carbon steel axles, shafts and the like had much to do with the definition of the number of tests. As finally to be submitted to the members, the specifications will require that one tension and one bend test shall be made from each annealing charge. If more than one quenching charge is represented in one annealing charge, one tension and one bend test shall be made from each quenching charge. If more than one melt is represented in an annealing charge, one tension and one bend test shall be made from each melt.

Changes in Steel Castings Specifications

The proposed changes in the specifications for steel castings were presented by F. D. Carney, assistant superintendent, Pennsylvania Steel Company. They were in part as follows: The process of manufacture has been changed to include so-called "converter steel," which does not run as high in phosphorus as ordinary grades of Bessemer steel. Annealing has been specified only for castings for which there are physical requirements, as it is often a detriment in other cases on account of warping, making the castings too soft, or unnecessary expense.

The maximum limit for carbon, for castings not subject to physical tests, has been reduced from 0.40 to 0.30, at the request of certain members of Committee A-1 representing railroad interests. A variation of 20 per cent. for check analyses of phosphorus and sulphur have been provided for, since this is absolutely necessary in order that the specifications may not be unduly burdensome to Western foundries, which have great trouble in securing low phosphorus, and to Eastern foundries, which have similar trouble with respect to sulphur. It has been specified that drillings from annealed castings shall be taken at least ¼ in. from the surface, on account of the reduction in carbon and the increase in sulphur sometimes caused in the skin of castings by annealing.

It has been specified that all test specimens shall be cut from test bars, which shall, if possible, be attached to the casting. On account of the great variations in size and design, it is impossible to state more definitely where these bars shall be attached than that the manufacturer and purchaser shall agree on their location. It is unfair to cut tests from the sinkhead as provided in the present specifications.

The tensile strength and yield point for hard castings have been lowered slightly to make an even range of figures and to bring them into better accord with the specified elongation and reduction of area. The percussive test has been omitted, as it is practically obsolete. In addition to being expensive, it does not meet the requirements. A clause has been inserted to provide for additional tests if the tests fail on account of flaws in the test pieces. A similar clause exists in Lloyd's and other specifications.

In the closing session Friday afternoon, announcement was made of the proposal to establish a committee on specifications for rubber products, including steam hose, air hose, belting, packing, etc.

Fighting the 12-Hour Day in Steel Plants

Charles M. Cabot, 95 Milk street, Boston, a stockholder in the United States Steel Corporation, is sending to all the other stockholders of the corporation a 20-page pamphlet giving a statement on "Hours of Labor in the Steel Industry," which was written after a full investigation, and at Mr. Cabot's request, by John A. Fitch, author of Volume IV of the Pittsburgh Survey. This statement points out that the corporation has decided to eliminate seven-day work from its plants, which comes as a result of a vigorous campaign on the part of certain executive officers after a previous Sunday rest order had been a dead letter for three years. Mr. Cabot says: "There are other labor policies in the corporation that must meet with our approval, but I believe that we should unhesitatingly condemn the 12-hour day and indicate we are willing to support a movement for a shorter work day in our great industry."

Mr. Cabot recommends that each stockholder expresses his views personally in a letter to Chairman E. H. Gary. Judge Gary is quoted as making the following statement in a reply which he has made to Mr. Cabot: "In most departments it does not seem practicable as yet to substitute eight hours for 12 hours. The men do not wish a change which will reduce their wages one-third and business conditions do not permit an increase in wages. We are spending annually for improvements among our workmen very great sums which would otherwise be available for dividends."

Mr. Fitch's investigation covered conditions at steel plants of independent companies as well as those of the corporation. He finds the 12-hour day prevailing in all.

The Diminishing Stocks of Copper

The metal market circular issued by Henry R. Merton & Co., Ltd., London, England, under date of March 16, has the following interesting statement regarding the diminution in the world's visible supply of copper:

The subjoined statement shows the rapid rate at which the stocks of copper have been depleted since October, 1911, when the upward movement in prices was started from the low basis of £55 for standard copper. The shrinkage in the last five months amounts to no less than 57,484 tons, of which by far the greater part was refined copper. The stocks which are left in reserve contain now a much larger proportion of unrefined copper which is not available for the immediate use of manufacturers.

Movements of the World's Visible Supplies of Copper Since October 1, 1911.

Gross tons	England and France	Holland and Germany	United States of America	World's total visible supplies
Supplies, October 1, 1911....	67,340	18,350	62,899	148,589
Supplies, March 1, 1912.....	51,507	11,500	28,098	91,105
Shrinkage in 5 months....	15,833	6,850	34,801	57,484

Details of the Monthly Reductions in the Supplies.

October	5,504	1,250	2,632	9,386
November	3,154	2,500	10,363	16,017
December	1,399	1,200	9,969	12,568
January	1,713	{	10,346	12,009
February	4,063	{ 1,900	1,491	7,504
Totals	15,833	6,850	34,801	57,484

In analyzing these remarkable figures, the circular continues, it should be remembered that the heavy depletion in stocks is almost entirely due to the enormous growth of consumption in Europe, American trade having only absorbed a few thousand tons more than in the preceding five months. There are now, however, distinct signs of a betterment in American economic conditions, which will undoubtedly lead to a larger consumption of copper in the near future. If both hemispheres should therefore absorb more copper simultaneously, a more rapid increase in production is absolutely necessary to prevent a runaway market.

The De Laval Steam Scale and Diagram

For determining the heat available from the expansion of steam from one pressure to another, determining the efficiency ratio of an engine or turbine of known steam consumption, or the quality of the steam at the end of expansion in a heat motor of known steam consumption the Mollier diagram is generally considered the most convenient. It is, however, open to the objection that as ordinarily arranged its use is rendered difficult and its accuracy somewhat impaired since the total heat of the steam for both pressures must be read from the scale and the difference between the two multiplied by 778 to give the number of foot-pounds available. All these difficulties have been removed in one stroke by the use of a steam scale devised and published by the De Laval Steam Turbine Company, Trenton, N. J.

This scale is a measuring rule having four different sets of graduations. The first of these is uniform and can be applied to the chart to measure the number of B. t. u. available for any given expansion of steam. The second scale shows the resulting velocity of the steam when expanded through a nozzle in feet per second, which can also be read without computation, and the third and fourth scales show the duty in million foot-pounds per 1000 pound of steam developed by a perfect engine working between the assumed limits and the steam consumption in pounds per horsepower-hour respectively. If the steam consumption of the engine be known the last scale enables the user to find the resulting quality of the steam at once from the diagram without any further measurement on computation. It is pointed out that the chart and the scale give an engineer the equivalent of complete steam and entropy tables, tables for converting B. t. u. per pound of steam to jet velocity and steam consumption and duty without computation. In general, the limits of error are less than one per cent, and for some of the operations the accuracy is even greater. Concise printed directions for using the scale, together with an illustrative example are given out the back of the chart.

Precision Boring Machine

Details of a Horizontal Boring, Drilling and Milling Machine and Its Vertical Milling Attachment

The Lucas Machine Tool Company, Cleveland, Ohio, has brought out a new type of horizontal boring, drilling and milling machine and also a vertical milling attachment for use in connection with it. The principal feature of the machine, which is known as the No. 33 Precision, is that it has constant feed, quick power movement to all parts having feeds, and this is so arranged that, regardless of the feeds being employed, the quick return for that feed is obtained by simply moving the feed and quick return lever in the opposite direction. When the lever is in the left-hand position it gives a quick vertical movement to the hand, a quick cross movement to the platen or a quick longitudinal movement to the saddle or to the spindle, depending upon the position of the interlocking feed-selecting levers on the cover of the gear box, which is located on the top of the bed. With the lever in the opposite or right-hand position, the corresponding feeds are obtained, and it is pointed out that it is impossible to use the power movement when any feed is engaged or to engage any feed when the power movement is in use. The vertical milling attachment is a new development that is easily applied and one which, it is pointed out, greatly increases the usefulness and versatility of the machine. When the attachment is in use the vertical spindle head can be fed by power along the rail, an arrangement which enables many forms of large work which would ordinarily have to be done by the slower method of planing, to be handled on this machine by milling. Another special feature of this attachment is the bridge form of construction employed, both ends of the rail being supported and rigidly tied together as a whole. Front and rear views of the machine are given in Figs. 1 and 2, the latter showing the method of attaching the electric motor. The vertical milling attachment applied to one of these machines is illustrated in Fig. 3.

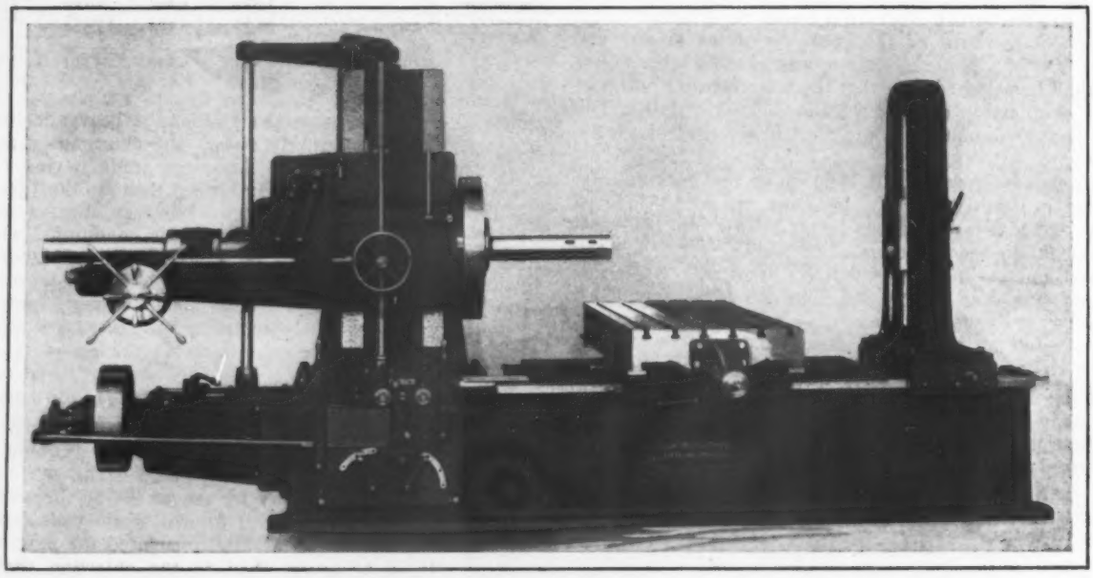


Fig. 1—Front View of the New No. 33 Precision Boring, Drilling and Milling Machine Built by the Lucas Machine Tool Company, Cleveland, Ohio

The Machine in Detail

Like all the other machines built by this company, the fundamental principle is raising and lowering the spindle head, which is a constant weight, instead of moving the table and its greatly varying load. This construction permits a deep and stiff bed to be used and gives a solid foundation for the other members. This part is of complete box section with a continuous bottom and a number of reinforcing ribs. This arrangement, it is pointed out, makes the machine thoroughly self-contained and enables it to be operated without building a foundation under it. Another advantage of this construction is that the machine can be moved from one part of the shop to another as changing conditions require. Guards, which are so designed that they make convenient tool pans, protect the top of the bed.

The column is also of box section and has been made quite large when it is fastened to the bed with bolts. The spindle head has a liberal bearing on the column with a long narrow guiding edge with taper gib for take-up on one side, and a square lock and cap with binder on the other. To give a large working surface the platen is of extra size and has great depth to resist any strain that should be brought upon it. The T-slots in this member are also deep, as can be seen by referring to Fig. 1. Square lock gibs are employed to fasten the platen and the saddle together. The length of the saddle is great, an arrangement which provides a firm support for the platen in both the extreme front and rear positions. This part has a liberal bearing on the bed, to which it is fastened by a square lock gib. Like the spindle head, it has a long and narrow guiding edge with a taper gib to compensate for wear. The back rest, which carries the tail block, is of complete box section and has a base with an ample bearing on the bed. When exceptionally long work is being handled the back rest can be removed from the base by simply taking out the four screws which hold it in place. The adjustment of the back rest base along the bed is by a wrench operating a pinion meshing with the saddle-adjusting screw, which in this instance serves as a rack. A clamping screw serves to secure the base in any desired position.

The spindle head and the tail block are connected by a shaft and planed bevel gears, and are thus raised and lowered in unison. The long V bearings of the tail block make it practically impossible for the back rest to spread, so that when both parts are bound together they are practically one piece. The high carbon steel spindle is ground throughout its entire length and cannot be lowered far enough to come in contact with the top of the platen. It does not revolve in boxes, but slides through a sleeve, which is a solid high-carbon steel forging. This sleeve has a conical journal at the front revolving in a solid bronze box, and a cylindrical journal at the rear revolving in an adjustable bronze box. In the spindle drive power is transmitted to a large diameter internal gear at the front of the spindle sleeve and to a smaller gear at the back. The former of these is employed for the slower speeds and the latter for the faster ones, an arrangement which avoids excessive speeds of the driving shafts. Conveniently located interlocking levers provide

the different speed changes, and the starting and stopping of the machine is controlled by a friction clutch attached to the driving pulley at the left of Fig. 1. Adjustments of this clutch are made by a nut at the end of the shaft without disturbing any other part.

The feed mechanism is operated by the two levers shown on the lower part of the gear box. These levers slide over quadrants and control sliding gears which give nine changes. This number is doubled by varying the position of the spindleback gears, so that a total of 18 changes ranging from 0.004 to 0.735 in. per revolution of the spindle are applicable to the spindle, spindle head and tail block, saddle and platen, and have the same value and range regardless of the point of application. To prevent damage of the feed gear train a safety friction is introduced. The reversing lever for the feed and quick return is located directly between the two speed-changing levers, and reverses any feed which may be engaged. The constant speed quick-power movement of all parts having feeds, and in the reverse directly from the feed, is obtained by simply moving the feed-engaging lever in the reverse direction. It is emphasized that the power movement cannot be used when any feed is engaged, and when the feed is engaged it is impossible to use the power movement.

Hand adjustments of the spindle head, platen and saddle can be made from either the front or the end of the machine, and they are so designed that no two parts can be adjusted at the same time with the same wrench. All the actuating screws, which are of large diameter, have dials graduated to read in thousandths of an inch. This enables holes to be bored and surfaces to be milled at exact distances apart and enables interchangeable work to be produced readily without the employment of jigs.

Both the feed and the quick-power movement have safety friction devices, that for the former consisting of a feed gear held between leather washers. The friction is adjusted by nuts, according to the kind of work to be done, and the purpose of the device is to introduce a yielding point that will slip before any of the mechanism is damaged. With this exception the feed is positive. The quick-power movement provides a safety friction in itself, since it is through a friction of the cone type controlled by hand. All the gears are inclosed and the levers are so arranged that, while they are easily reached, they are not crowded together.

The drive, whether by belt or electric motor, is of the constant-speed type, the variations in the spindle speed being by gears giving a range of from 5 to 151 r.p.m. All of the driving gears are of steel and the bearings are bronze bushed.

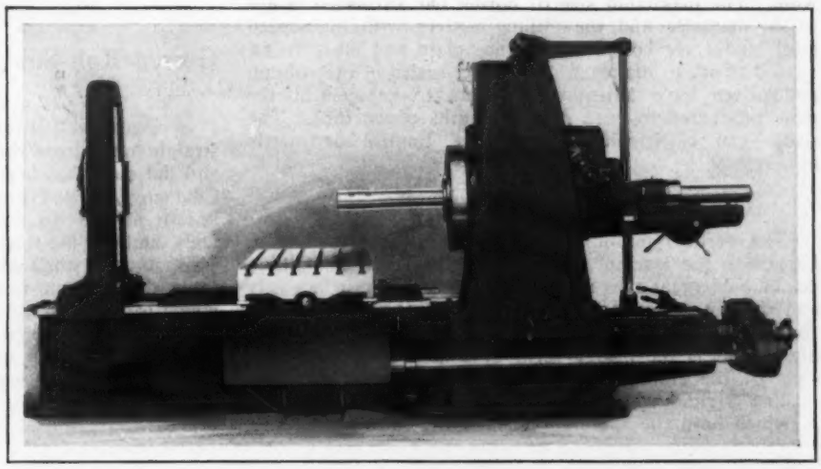


Fig. 2—Rear View of the Motor-Driven Machine Showing Method of Attaching Motor

The following table gives the principal dimensions and specifications of the machine:

Diameter of spindle, in.	4½
Morse taper of hole in spindle	No. 6
Total traverse of spindle, in.	60
Maximum distance between face plate and outer support, ft.	7
Maximum distance from top of platen to spindle center, in.	28½
Size of platen, in.	30 x 56
Platen cross feed, in.	44
Number of feed changes	18
Minimum feed per revolution of spindle, in.	0.004
Maximum feed per revolution of spindle, in.	0.735
Number of spindle speeds	18
Minimum spindle speed, r.p.m.	5
Maximum spindle speed, r.p.m.	151
Diameter of driving pulley, in.	20
Width of driving belt, in.	4½
Speed of driving pulley, r.p.m.	300
Size of electric motor for motor drive, hp.	10
Speed of motor, r.p.m.	1,000-1,200
Approximate shipping weight, lb.	18,000

If desired, the machine can be supplied with an electric motor as shown in Fig. 2. Among the attachments which can be furnished on special order are circular and rectangular swiveling tables, an auxiliary table, boring

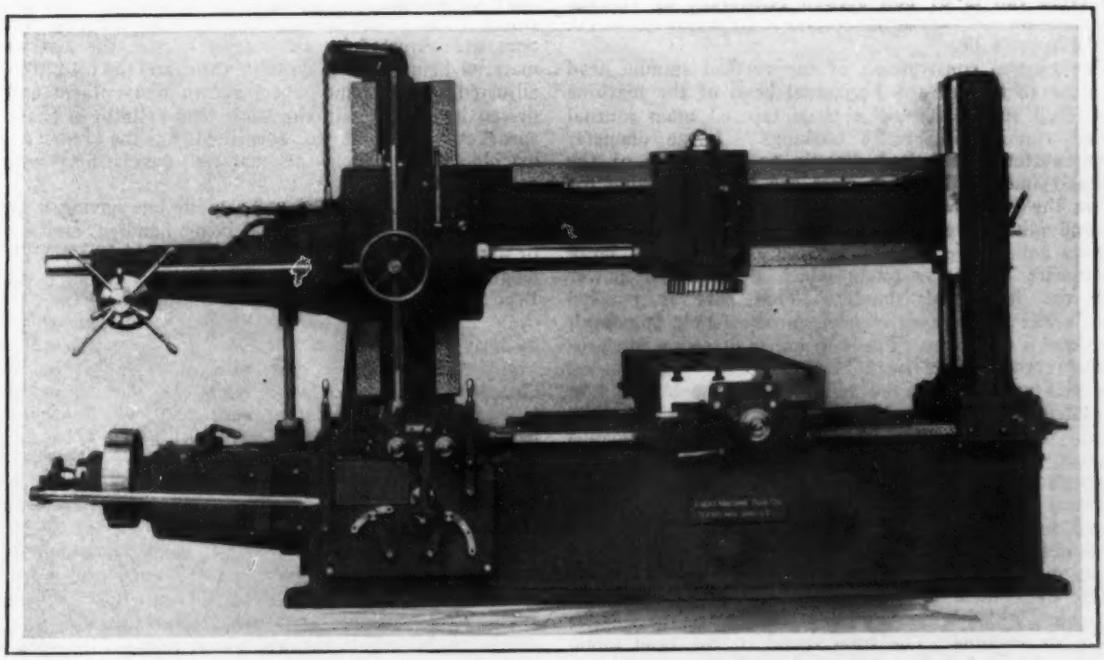


Fig. 3—The Machine Equipped with a Special Vertical Milling Attachment

bars, inserted tooth-face milling cutters and steel scales in both the column and the platen. The circular swiveling table is 36 in. in diameter and 4½ in. thick, and is graduated in half degrees. The rectangular swiveling table measures 36 x 42 in. and 5½ in. thick and is also graduated in half degrees. This last can be furnished either with or without a lock bolt for four positions spaced 90 deg. apart. The auxiliary table, which is designed to support long work, is 7 ft. long and 5 in. wide. The maximum size of boring bar furnished is 4½ in. in diameter and the milling cutters with high-speed steel blades are bolted to the face plate and measure 12, 15 and 18 in. in diameter. The steel scales in the column and platen have adjustable pointers to supplement the dials graduated to read in thousandths of an inch. The scales can be supplied with either English or metric graduations.

Vertical Milling Attachment

The vertical milling attachment illustrated in Fig. 3, applied to the machine, converts it into a vertical milling machine of great range and convenience. It can be easily and quickly removed, leaving the machine unencumbered for its regular uses. One of the special features of this attachment is the bridge form of construction with both ends of the cross rail strongly tied to its supports and making a rigid whole instead of the conventional design in which both the spindle head and the saddle overhang. The cross rail is of box section reinforced by ribbing, and possesses sufficient depth to give a good bearing to the vertical spindle head.

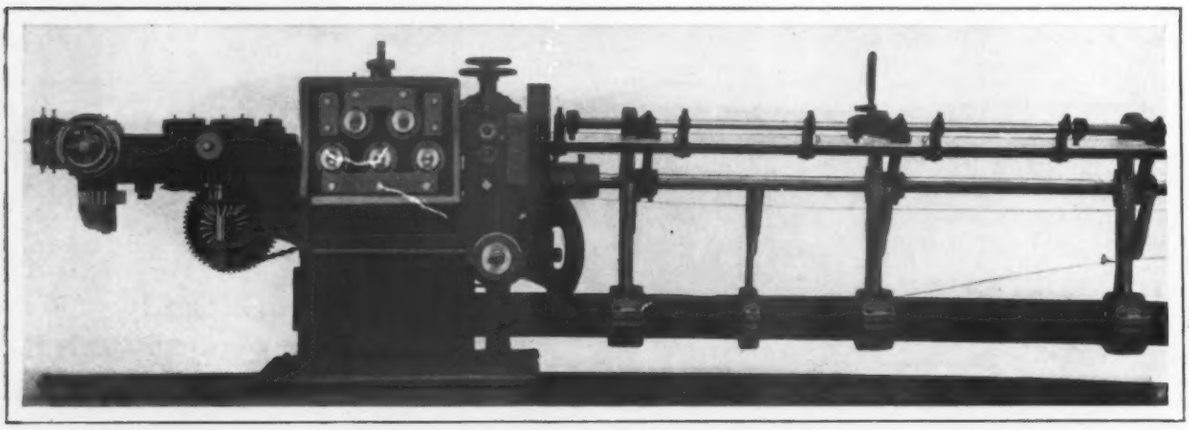
The general construction of the vertical spindle head is similar to that of the horizontal head of the machine itself, each spindle having a large tapered main journal bearing running in bronze bushings. Large diameter milling cutters are bolted directly to the flange of the vertical spindle and certain sizes are interchangeable for use on the horizontal spindle sleeve. Small milling cutters and other taper shank tools are held in place by a draw-in bolt. The vertical spindle is driven by large bevel gears of coarse pitch, which derive their power from the horizontal spindle. This part is coupled to the vertical spindle driving pinion shaft by a two-tooth clutch and a taper key. Feeds in either direction are provided for the spindle head along the cross rail, to the cross rail vertically, to the saddle along the bed and to the platen across the saddle. These are secured by the regular feed mechanism, an arrangement which avoids complication and makes everything easily controlled from a central position. The constant-speed, quick-power movement to all these parts, which is always in the reverse direction to the feed that is in use or ready for use, is obtained by moving the feed-engaging lever in the reverse direction.

This attachment can be furnished for either the No. 33 machine, which is the one illustrated, or for the smaller or No. 32 machine. The total travel of the head along the rail is 60 and 51 in. respectively. The maximum distance from the top of the platen to the face of the vertical spindle is 24½ and 20½ in. for the two machines, and this can be increased 6 in. when specially ordered. From the top of the platen to the face of the milling cutter the greatest distance is 22¼ and 18¼ in., and this can also be increased 6 in. when the high-pattern column and back rest are specially ordered. The largest diameter of milling cutter recommended for the two machines is 15 and 12 in. respectively. The Morse taper of the hole in the vertical spindle is No. 6 in both cases.

Geared Roll Straightener and Cutter for Bar and Flat Stock

A geared-roll straightening and cutting machine for straightening from the coil and cutting square, hexagonal and flat stock has been recently built by the F. B. Shuster Company, New Haven, Conn. The machine, which is known as the No. 6 size, will handle flat stock 1¼ in. wide and ¼ in. thick, and is also capable of handling ¾-in. square stock or hexagonal material measuring the same distance on a side. The extreme length of piece which can be cut is 20 ft., although only a portion of the extension is shown in the accompanying engraving.

A balance wheel which connects with a train of gears operating the horizontal and vertical straightening and feed rolls drives the machine. There are 10 rolls, all geared and grooved for the shape of the material they have to handle, five being vertical and five being horizontal. The upper horizontal rolls and the rear vertical ones are adjusted by set screws to suit the size of the material being passed through them, and the feed rolls are adjusted by the hand wheel shown above them and are driven in unison with the back feed rolls by a chain and sprocket. A guide is furnished at the rear of the machine, into which the material passes first when it comes from the coil.



Front View of the New No. 6 Geared Roll Straightener and Cutter for Square, Hexagonal and Flat Stock Built by the F. B. Shuster Company, New Haven, Conn.

The extension consists of a guide bar having a groove for the shape of the material being handled, and a cover or apron. An adjustable stock gauge, which is set for the length of stock to be cut, is located in this groove. Brackets for catching the cut material as it falls out of the guide bar form a part of the extension being supported by heavy floor brackets.

In operation the coil of stock is mounted on a reel placed at the rear of the machine. The loose end is inserted into the guide at the rear of the machine and passes from there to the rear feed rolls. It next goes into the straightening rolls and then into the front feed rolls, through the bush die, past the cutter knife and out through the groove in the guide bar until it strikes the stop gauge. This contact sets the cutting mechanism in motion and the knife severs the piece. The cover of the guide bar is thrown open when the cutting operation is completed, and the pieces drop out into the forked holders. At the instant the stock strikes the stop gauge a clutch mechanism is thrown, which releases the feed rolls and causes them to remain stationary while the cutting is being done.

Speed Limit Device for Electric Machinery

Positive action, the use of few parts and rugged and compact construction are the special advantageous features claimed for a new overspeed limit device which has been developed by the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa. This will be furnished on all the rotary converters built by this company in the future, and if specially ordered will be supplied as a part of its motor-generator sets. The application of the device to the end of a rotary converter shaft is shown in Fig. 1, while the details of its construction are illustrated in Fig. 2.

The operation of the mechanism will be understood by referring to Fig. 2. Normally the trip lever *a*, which is also shown in Fig. 1 at A, is held in the position indicated by the full lines by the action of the trip spring *b*, Fig. 2. The device is set to operate when the speed exceeds that of normal operation by 15 per cent., and when that limit is reached the trip lever flys outward positively and quickly under the influence of centrifugal force and knocks over the switch arm *c*, C, Fig. 1. This movement of the switch arm closes the switch. An interesting and important point in connection with the action of the trip lever is its positiveness. If it begins to fly out and the speed remains either constant or increases the trip lever will continue until it strikes the stop due to the proportion and disposition of the trip spring and the trip lever. The point on the latter member which strikes the switch arm is approximately at the center of percussion of the lever, a fact which it is emphasized insures an effective blow being struck by the lever. The switch arm is normally held in the open position by a toggle spring, *d*, Fig. 2. The relation of the spring to the lever is such that the resisting torque of the spring is a minimum. When the trip lever strikes the switch arm it forces the latter past the center point of the toggle mechanism and the switch closes automatically under the influence of the tension of the spring. The distance which the trip lever is required to move to close the switch is very small, 3/32 in. being sufficient. The relation of the various parts of the mechanism is such that when the arm is in the closed position the contacts are forced against the contact blocks with much more pressure than is required to trip the switch. Resetting the switch is accomplished by moving the switch arm back to the normal position by hand, and this can be done at any time without opening the switch box, regardless of whether the machine is in operation or not.

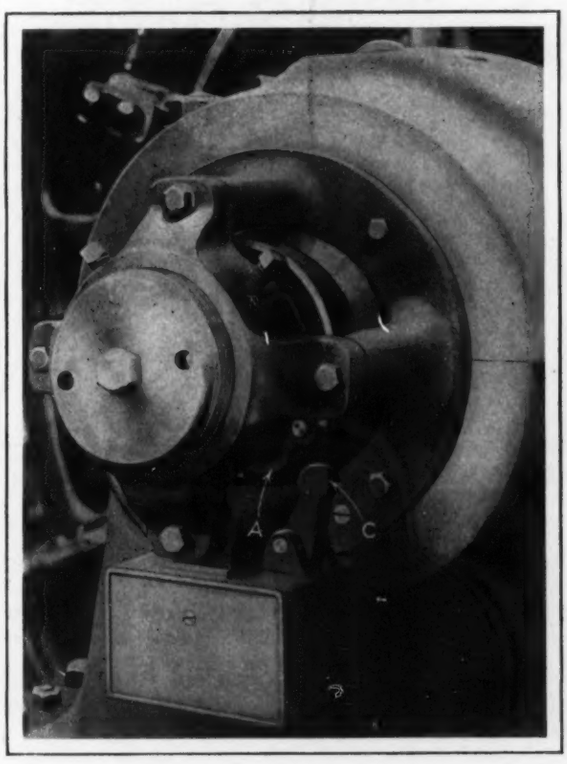


Fig. 1—A Rotary Converter Equipped with the New Speed Limit Device Developed by the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

The number of parts involved is small, as can be seen by an examination of the detail view, Fig. 2. The maximum diameter of any bearing pin is ½ in. and the various other parts of the device have been made correspondingly strong. The position of the trip lever can be regulated by adjusting screws so that it will act at the predetermined speed and the sensitiveness of the switch arm's action can also be regulated in the same way.

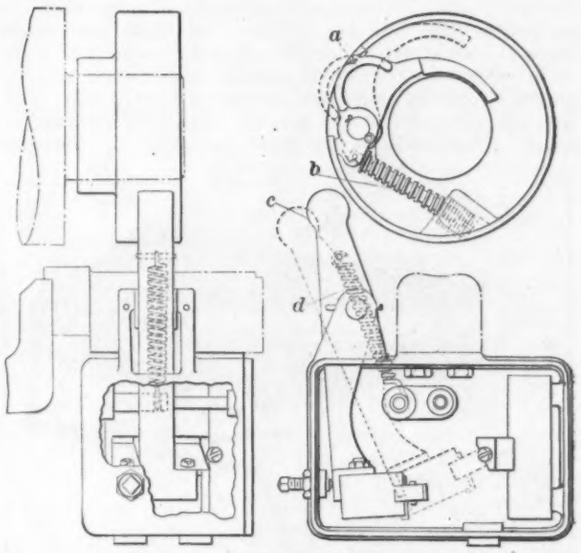


Fig. 2—A Detail View of the Device

The electrical connections for this device are the same as those used in the maker's former standard overspeed trip arrangement. If the speed of the machine rises above the predetermined limit the trip lever flies out, the switch arm forces its contacts against the contact blocks and an auxiliary circuit is closed. This energizes the solenoid of a tripping device on the alternating-current circuit breakers which operates and opens the breakers, thus cutting off the machine from its source of supply.

In addition to the manually reset switch type another has been developed which can be reset by a solenoid arranged within the switch box. In this arrangement a circuit extends from the solenoid to the switchboard and the equipment is so designed that after the switch has been tripped it can be reset by closing the solenoid circuit by pressing a contact button located at the switchboard or any other convenient point. This arrangement is, however, not standard and is furnished only when specified by the purchaser.

National Gas Engine Show

The National Gas Engine Association announces that in connection with its convention the first annual national gas engine show will be held in Milwaukee, Wis., June 17 to 22, inclusive. It will be held in the Auditorium, where about 100 exhibition spaces have been laid out, and will include everything in gas power and allied lines. Exhibits will not only comprise the stationary and heavy-duty type of engine, but also the small farm engine, the marine engine, the automobile engine, and possibly the aeronautic motor. Spaces will be allotted in the building to manufacturers of accessories. Space adjoining the building will provide an arena for tractor exhibits. Applications for space should be made to O. C. Parker, president of the association, La Crosse, Wis. Albert Stritmatter, Cincinnati, Ohio, secretary of the association, announces that the programme for the meeting is now being arranged and that there will probably be sessions at which papers intended particularly for dealers and individual users will be prepared by men of high standing in the business.

The Covington Machine Company, Covington, Va., furnished several large shears to the Portsmouth Steel Company, whose plant was illustrated and described in *The Iron Age* of March 28.

Sheet Metal Shear, Cutting Reverse Curves

As the result of the peculiar demands of the automobile industry, H. Collier Smith, 125 Harper avenue, Detroit, Mich., has developed a novel type of rotary shear which cuts reverse curves. Although designed primarily for the automobile industry, the machine can nevertheless be used for all classes of sheet metal work. Several years ago, when the designer went into automobile work, he found that there were no shears or other means of cutting sheet steel for use in body panels, fenders, etc., that would not stretch, burr and mutilate the metal. The ordinary rotary shears could be employed

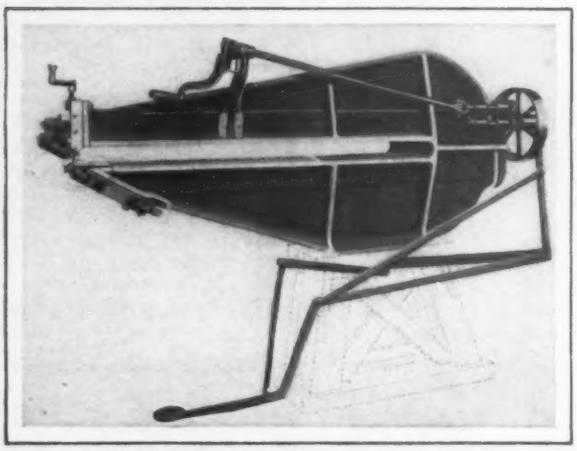


Fig. 1—A Novel Type of Rotary Shear Which Cuts Reverse Curves Designed by H. Collier Smith, Detroit, Mich.

for cutting a straight line, but curves could not be cut. It is explained that for automobile work it is absolutely necessary that the sheets of steel or aluminum be perfectly flat and that when the cut is made that this level is not destroyed. Once the metal has become stretched or buckled it is impossible to restore the surface, and it has a wavy effect after the surface is painted and varnished. Numerous experiments were made with cutters placed in various positions and it was found that if both cutters were placed with their axes at an angle to the surface of the metal being cut, a conical or curved surface on each of the adjacent cutter faces resulted, which permitted the curved lines of the pattern to be followed without bending the edges of the metal. By placing both cutters at an angle reverse curves could be cut easily. Fig. 1 is a view of the shear and Fig. 2 illustrates some examples of the work turned out by it.

The shear shown in Fig. 1 is intended to cut curves of short radius in any direction without affecting the surface of the metal. These machines are suitable for all classes of sheet metal work and they will not only cut irregular curves as shown in the lower portion of Fig. 2, but they will also cut a hole or opening out of the center of the sheet without cutting in from the sides of the sheet, an example of this being shown in the upper portion of Fig. 2. It is emphasized that this shear will cut

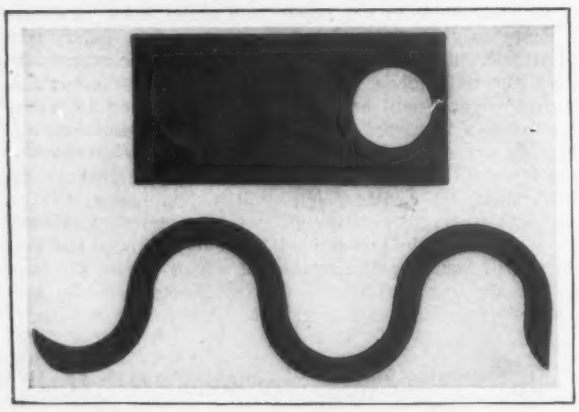


Fig. 2—Examples of Work Produced by the Shear

curves of 1⅜-in. radius in any direction without mutilating the sheet, and that the necessity of straightening out and smoothing the sheet is obviated. The work turned out by it is said to be as flat and smooth as if it were blanked out by a die or punch press. Some of the special fields for which this machine are adapted are tank work, parts for steel cars, steel blowers, the cutting of elbows and tees in ventilating and other pipe work, cornice and skylight bar miters and all classes of sheet metal work.

Four sizes in all of machine are built. The capacities of these shears are No. 16 gauge steel and lighter with a 60-in. throat, No. 16 gauge steel and lighter with a 30-in. throat, No. 12 gauge steel and lighter with a 30-in. throat and ¼-in. steel and lighter with a 30-in. throat. The first three machines are arranged for either power or hand drive, the change being made at will instantly, but the ¼-in. machine is arranged for power drive only.

Automatic Worm Feed Drilling Machine

Interesting Features Including a Safety Release of the Latest Product of the Dwight Slate Machine Company

In addition to the cam feed automatic drilling machine which was illustrated in *The Iron Age*, March 21, 1912, the Dwight Slate Machine Company, Hartford, Conn., also builds a machine in which the feed is controlled automatically by a worm and worm gear. The general construction of the two types of machines is the same, the only

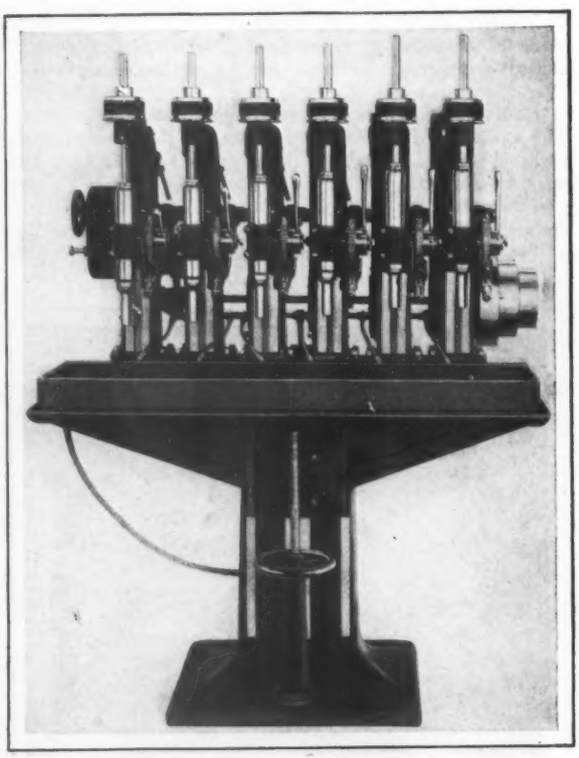


Fig. 1—A Six-Spindle 15-In. Automatic Worm Feed Drilling Machine Built by the Dwight Slate Machine Company, Hartford, Conn.

difference being in the feeding mechanism. A six-spindle 15-in. drilling machine with automatic worm feed is illustrated in Fig. 1, while details of the feeding mechanism are given in Figs. 2 and 3, which are a side elevation and a plan view, respectively.

Referring to Figs. 2 and 3, which give the details of the mechanism, the worm *f*, Fig. 2, is supported and held in engagement with the worm gear *r*, Figs. 2 and 3, by the latch arm *a*, which rests upon a supporting stud, *i*. The automatic knock-off for any depth of feed between 0 and 5¼ in. is adjusted by fastening the ring *b* to the pinion

shaft *l* through the operation of the screw *n* and the shoe *k*, a stop pin, *p*, Fig. 3, determining the maximum adjustment for the rings. The position of the ring on the shaft with respect to the depth of feed desired is such as will permit the projection on the ring to travel the distance required to disengage the latch arm from the supporting stud.

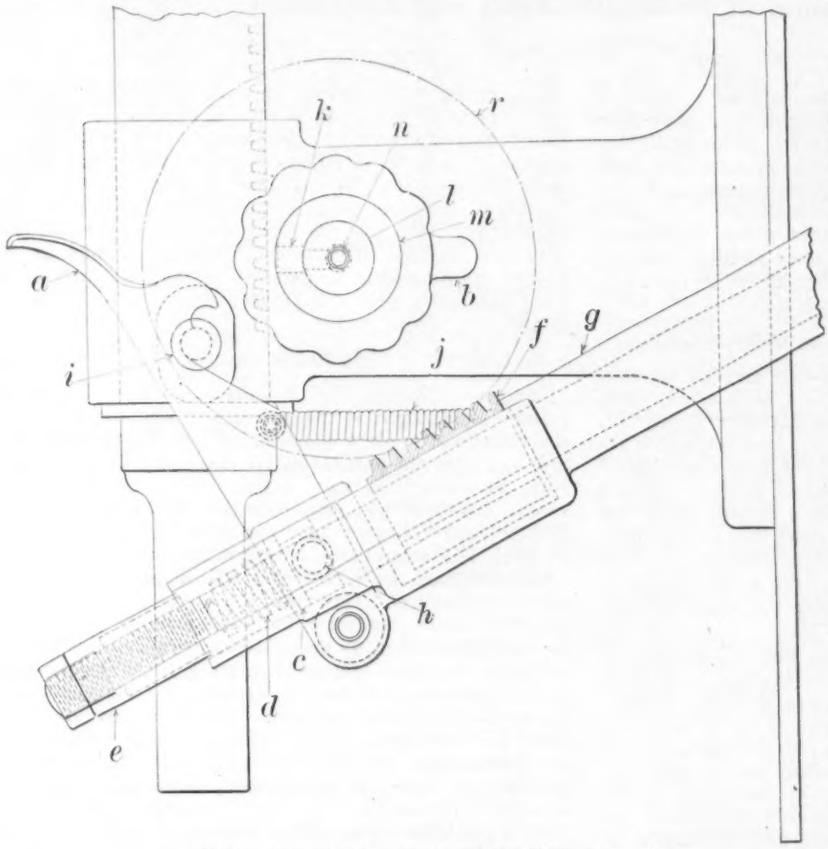


Fig. 2—Side Elevation of the Feeding Mechanism

Like the cam feed machine this tool also has an automatic safety release to prevent breakage of gears in the feeding mechanism or of drills should an overload occur. The worm *f*, Fig. 2, although keyed to its shaft, is nevertheless free to slide longitudinally. Under normal operating conditions, the worm is kept in mesh with the worm gear *r*, Figs. 2 and 3, by the ring *c*, Fig. 2, and the compression spring *d*. This latter part yields when an overload occurs and permits the worm to slide slightly. The movement is sufficient to force the ring *c*, carrying the pin *h* to disengage the latch arm *a*, Figs. 2 and 3, from its supporting pin *i*. The tension of the compression spring *d*, Fig. 2, can be regulated according to the different sizes of drills employed. This adjustment is made by the cap *e* and the lock nut.

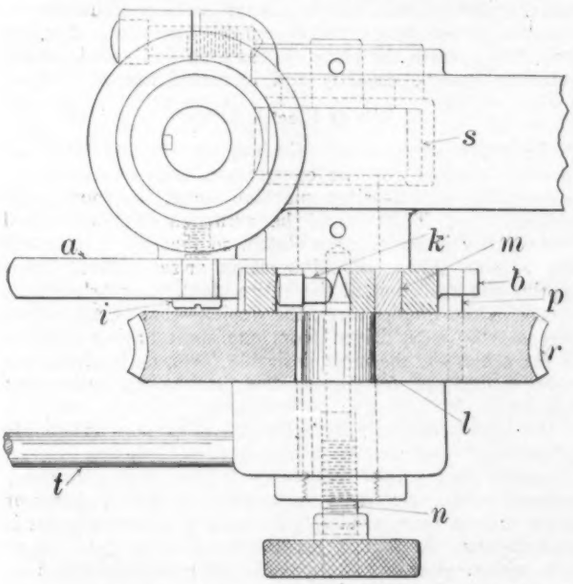


Fig. 3—Plan View of the Automatic Worm Feed

If it is desired to stop the feed at any time this can be done by throwing out the latch *a*, Figs. 2 and 3, and the feed can be re-engaged by lifting the arm *g*, Fig. 2, which supports the shaft upon which the worm *f* rotates. When this is done the tension spring *j* causes the latch *a*, Figs. 2 and 3, to fall into position on the supporting stud *i*.

These machines are built with two, three, four, five, six and eight spindles, and all of these are driven by independent belts from the countershaft at the rear of the machine.

The Chicago sales office of the Deforest Sheet & Tinplate Company, which is under the management of W. H. Meyst, has been moved to 411 First National Bank Building, securing more commodious quarters. Mr. Meyst reports the booking of some very good tonnage of sheet steel, particularly in Lohmannized sheets. This process, which is described in *The Iron Age* of March 14, was developed in the mills of the Deforest Company under the direction and counsel of Professor Lohmann and for a time that company was the sole manufacturer of the product.

Railroads to Sell Steel Company Stocks

The report is given publicity that the Pennsylvania Railroad Company and the Reading Company, acting on hints from the Federal authorities, are preparing to dispose of their interests in the Pennsylvania Steel Company and the Cambria Steel Company. Control of the steel companies is said to be about to pass to a syndicate of capitalists in Philadelphia, New York, Pittsburgh and Baltimore.

The control of these steel companies by the railroad companies was acquired in 1901, shortly after the organization of the United States Steel Corporation, for fear that the railroads would be compelled to pay an unduly high price for rails, cars, bridge material, etc., and that further they might be forced to make exceedingly low rates or grant rebates on freight shipments of the Steel Corporation. Since the abolition of rebates and the rigid control of rates exercised by the Interstate Commerce Commission have practically done away with discrimination of this kind, the necessity for the connection of the railroad companies with the two steel companies has passed and the retention of the stocks of the steel companies is being questioned seriously at Washington as a violation of the commodities clause of the Hepburn law.

The Pennsylvania Railroad Company, either directly or through the Pennsylvania Company, a subsidiary, owns $22,504,000 of the $45,000,000 capital stock of the Cambria Steel Company. Of the $10,000,000 common stock of the Pennsylvania Steel Company $7,388,900 is owned by the Pennsylvania Railroad Company and about $2,625,000 by the Reading Company through its subsidiary, the Reading Iron Company. Of the $20,560,800 preferred stock of the Pennsylvania Steel Company about $9,750,000 is owned by the Pennsylvania Railroad Company and about $6,800,000 by the Reading Iron Company. The Pennsylvania Railroad Company, it is understood, would welcome a release of the capital tied up in these companies in order to employ it in transportation requirements.

The Use of Compressed Air in Boiler Shops*

Producing and Storing Compressed Air— Transmission of Air to Points of Application— Discussion of Pneumatic Tools and Appliances

BY THOMAS ALDCORN

A boiler shop without air tools for one purpose or another is almost unthinkable in these days of close competition. At the same time there are many small and some large shops where extensions or improvements could be made, and the purpose of the present paper is to run over, briefly, the production, transmission and use of air and the use of air tools in a manner which, it is hoped, will be of interest and helpful to some at least, although many here present are thoroughly familiar with the whole subject.

How the Machinery Equipment Is Determined

The character and quantity of output must of necessity influence or govern the machinery equipment of any shop. Now, from this standpoint, let us run over briefly any general boiler shop. Is the output standardized, and is the work mainly duplication in smaller or larger quantities? Is it special, each case almost individual, or does it fall in the much larger class of jobbing—that is, part repair and part manufacturing? Each class may be further subdivided, but in final analyses certain fundamental features will be found common to all, with a wide range of special methods, apparatus and uses applicable to each class.

It should be borne in mind, also, that a discussion of the general subject will depend upon whether it is to cover an existing plant or the planning of a new installation. However, a logical treatment is to employ the natural subdivisions of production, or the methods and machinery of producing and storing compressed air; transmission, or the piping and means for conveying air to the points of application; separators or devices for cleaning and drying the air, and the final application or use of air through the medium of the standard tools and a large number of special appliances.

Each Installation Requires Individual Consideration

There are a variety of ways to compress air, each having some feature or features which may make it best for a certain set of conditions, and equally unsatisfactory under other conditions. Each installation requires careful individual consideration, and it is not best to attempt to make many sweeping general conditions which will apply equally in all cases so far as air compressing machinery is concerned.

Further, conditions change as a shop develops, and an equipment which in the beginning was adequate, and no doubt well selected to meet the then existing conditions, becomes inefficient and unsuited, due to gradual extension and additions not contemplated in the beginning. Besides, the wide range of uses to which compressed air lends itself is not at first fully appreciated, and experience may call for the installation of a device or machine at a remote place, or the use of a special appliance calling for a considerable volume of air, any one of which causes will disturb the balance of a once perfect plant.

The Proper Pressure and Volume

General experience shows that for best all-round work the proper pressure at the point of application is from 90 to 100 lb., and in some cases even slightly higher; however, 100 lb. at the tool will meet every requirement of 99 cases out of 100.

To give 90 to 100 lb. at the tool will call for a terminal or receiver pressure of from 100 to 110 lb., depending on the piping or transmission system, to be discussed later. We now have the first production factor—pressure. Next comes the question of volume of air required, and this in turn necessitates a careful study of present and future requirements: What types of tool; the number of each to be operated; the probable number operated at the same time; the average time of operation of each; what special appliances will be installed; is air to be reheated, and what provision is to be made for growth?

Fairly accurate tables are obtainable giving the air requirements for all standard tools and machines, and data are available from which the total volume of air needed can be readily worked out, or the manufacturer of compressor and tools will be very glad to assist in determining this second factor.

The Power Available

Having obtained the volume necessary, the third prime consideration is the power available for operating the compressor. Here again special conditions must govern, and it is not possible to lay down any hard and fast rule. If steam is at hand a steam-driven compressor of simple, duplex or compound type, depending on the steam pressure and volume of air, generally recommends itself.

With low steam pressure from 75 to 100 lb. and a required volume not exceeding 800 ft., a single air cylinder finds frequent use. This type is not the most economical from the steam standpoint, but is compact, simple in construction and has many desirable features. Above 800 ft., and with the same low steam pressures, the duplex type with the advantage of four power impulses for each revolution is frequently employed. Either duplex or two-stage air cylinders are used with this type. When the steam pressure is above 100 lb., compound cylinders should generally be employed, and especially if the steam pressure is much above 100 lb.

For the larger sizes, from 1000 cu. ft. up, compound steam cylinders are almost essential and also two-stage air cylinders. Larger units, of 2000 ft. and upward, should be of the Corliss type, their greater first cost being soon offset by the considerable saving effected by their low steam consumption.

It is also well, when the volume of air to be supplied is large, to install two units, each having a capacity equal to light working demands or both together having a combined capacity equal to maximum demand and also some reserve for growth. It is always well to figure on a machine or equipment in excess of immediate demands and then operate the plant at less than full speed, with a resulting reserve capacity and increased life.

Belt or Electric Drive

In many shops where shafting is running near the location selected for the compressor, and surplus power is available, a belt-driven machine forms the most satisfactory type. This should be arranged with tight and loose pulley if small, or a clutch, so that the compressor can be shut down, should occasion arise, without interrupting the operation of the entire plant. For belt-driven, except in the smaller sizes, the duplex—that is, two cylinders side by side, driven from one shaft having a pulley at the center—is the most desirable form, as it gives four compressions per fevolution, thus producing a more even belt load.

All belt-driven machines of whatever size or type should be securely anchored to a foundation to insure correct alignment and proper resistance to belt pull. In every instance where electricity is available a belt compressor can be driven from a suitable motor. This arrangement is advantageous, in that it permits starting or stopping at will, without the intervention of idle pulleys, clutches or other power-absorbing devices.

Latterly motor-driven compressors are in considerable demand, either geared or, in the case of larger units, with motor mounted directly on the compressor shaft. For the smaller sizes an automatic starting controller and pressure regulator can be furnished if desired, and this

*Read before the American Boiler Manufacturers' Association, New Orleans, La., March 13, 1912.

will maintain practically a constant pressure, shutting down the motor when the desired limit is reached, or starting up where the pressure falls, due to an increased demand for air.

Still another method of driving in larger units is to mount the motor armature or rotor directly on the compressor shaft, an arrangement somewhat like a direct-driven generator outfit. The power is applied directly to the shaft, and all belts, gears and other parts are unnecessary. This arrangement is, without doubt, the most simple and efficient type of power-driven compressor. However, it is not available except in sizes from 500 ft. and above, because mechanical and electrical reasons will not permit the manufacture of slow-speed motors at sufficiently low cost to compare with motors for belt or gear drive. At the same time the simplicity of this type and its high operating economy recommend its use wherever possible, even at a much higher first cost.

Remember that the power-generating plant, of which the air compressor is an important element, is really the heart of the establishment, and it is poor economy to skimp on that end, for a day's shutdown, due to failure of an essential part, may cost much more in money and prestige than the few extra hundreds called for in the beginning by the better equipment.

The Inlet Conditions

In piping up the compressor it is well, if possible, to take the inlet air from the shady side of the building or from outside the engine room, where cool air can be obtained, as each 5 deg. reduction in initial temperature will effect a saving of 1 per cent. in the operation of the compressor, or intake air 25 deg. colder will increase the capacity of the compressor 5 per cent. It is also well to make the inlet of good size and as short and direct as possible, to reduce inlet friction to a minimum.

Often, and always if in a dusty or sooty location, it is advisable to put a strainer on the exposed end of the inlet pipe or box. Such a strainer can be readily made by covering one side of a substantial box with wire netting and putting outside of this one or two layers of muslin, through which the air must be drawn. While a strainer is not essential under ordinary conditions, in many cases it is, and in nearly all cases strained air will help avoid lubrication troubles and add to the life of valves, piston and glands.

The After Cooler

The compressed air leaves the compressor at a fairly high temperature, averaging about 350 deg. As the amount of invisible moisture which can be held in air depends on its temperature, it is evident that all the moisture taken into the compressor is also discharged therefrom, to condense in the receiver or air mains later on. That this needs consideration is evident when it is recalled that a 500 cu. ft. compressor will draw in through the intake pipe $500 \times 60 \times 10 = 300{,}000$ cu. ft. of air per day of 10 hours, and on a damp or rainy day this may contain as much as a barrel of water for the day, although the average would be less. For this reason, especially in the larger installations, an efficient after cooler is most desirable, and it is actually essential if the transmission lines are long or exposed to the outdoors.

The after cooler is a device arranged to take advantage of the principle mentioned; that is, air will carry a varying amount of moisture, depending on its temperature, or at a given temperature air will hold only a certain amount of moisture, beyond which it becomes saturated and the excess moisture will be precipitated as dew or rain. Hence, if we can reduce the temperature of the air below that at which it will enter the transmission mains, moisture troubles will be very largely eliminated.

Of course, it must be remembered that when the air is actually used or expanded in the exhaust of the pump, engine, drill or other air-driven device the rapid expansion causes a temperature reduction considerably below what can be obtained in the usual water-cooled after cooler, and there may be some precipitation from the compressed air at the point of application. Usually, however, the moisture noticed around air tools is on the outside and is really the accumulation from the surrounding air, like the moisture on the outside of a glass of ice water.

In principle the after cooler is simply a tank or receiver of suitable size and shape, to contain a nest of closely placed iron or brass tubes through which cooling water is circulated. The heated compressed air enters the tank and by means of baffle plates and tubes is forced to split up into thin sheets which wind in and about the cooling tube and give up to the water a proportion of the heat contained in the air, if such an expression will be permitted. The heat thus absorbed by the water is carried off and the chilling of the air reduces its saturation point to such an extent that most of the moisture is precipitated and collects at the bottom of the tank portion of the after cooler. The air then passes out in a very much drier condition. While very desirable in larger installations, the after cooler is not necessary, and many installations have been operated for years without one.

The Receiver

From the compressor the air passes to the receiver, which performs a twofold function: First, as an equalizer of the pressure, to receive the rapid pulsations of the compressor's discharge, and, like a spring, or the gas bag on a gas engine, equalize or smooth out the pulsations, thus insuring a steady flow of air to the transmission lines. Second, to contain a stored supply of compressed air, which helps the compressor over any sudden momentary increased demand for air.

There is an erroneous idea current with regard to the storage of air, for, without the use of an excessively large receiver it is not possible to store more than a few seconds' or a minute's supply. A receiver 48 in. in diameter and 12 ft. long contains about 153 cu. ft.; when filled with air at 100 lb. pressure it will hold about 1200 cu. ft. of free air. If the compressors supplying were shut down the flow through a 1½-in. main would in a few seconds drop the pressure from 100 lb. to a pressure too low for working purposes. It is therefore evident that, except under peculiar conditions, the storage feature should be ignored and a compressor installed of sufficient capacity to easily take care of immediate and reasonable future requirements.

The receiver should always, if possible, be set up outside in a shady and cool place where the heated air from the compressor may have a chance to cool off and precipitate as much moisture as possible. To take care of this a suitable drain should be provided and used frequently to blow off any accumulated moisture or excess oil, if the operator has been careless enough to allow such a thing to happen.

Frequently it is a good plan to install additional receivers at junction points or elsewhere in the transmission system, to equalize the pressure and to take care of any sudden or excessive local demand. These auxiliary receivers also act as separators to remove from the air additional grit and moisture.

The Transmission

The transmission system or pipes conveying the air from the compressor to the various points of usage should receive most careful attention, both in location and in putting up. Lines should be made of ample proportion and figured with due regard to equivalent areas. They should be run as direct as possible, with few turns or angles, and it will pay in the end if bends or long turn fittings are used. Branches and outlets should be near enough to permit of sufficient tools being operated without the use of long hose lines, usually so that a 50-ft. hose will over-reach another 50-ft. hose. Each branch should have a tee and two outlets closed with good, solid globe or gate valves.

The practice of using nothing less than 1-in. pipe for branches is to be recommended. Full-weight pipes, substantial fittings, first-grade valves and care in supporting mains, drops and branches are all essential, for it must be remembered that with air at 100 lb. pressure a 1/16-in. hole will leak the equivalent of a horsepower for each five min. Two or three such leaks, even in a large plant, would be a serious loss.

All piping should be carefully inspected, rapped to break loose inside scale, and then blown out. All joints should be made up with lead and screwed up tight, and every precaution taken to make the work permanently air-tight. At suitable points drip tanks or separators should be inserted in the mains, these being provided with drip

cocks. Drip cocks should also be placed at all low points. Further, it should be the duty of some one to see that all drips are blown off frequently and properly.

Outlets should all be provided with an approved form of universal quick-acting and locking hose coupling, and the same form should be used through and on all hose for interchangeability.

Only the best grades of hose should be used, wire wound for the longer or leader hose, and a short length of plain tubing for connecting with the leader. All hose should be cared for. It is expensive and deteriorates rapidly, and it has been shown that many troubles charged against the tool have been due entirely to the use of poor grades of hose, which have stripped or scaled inside and clogged the valve or working part of the air tool equipment. The hose should be regarded as part of the tool equipment, and each man to whom hose is issued should be held responsible for its return in good condition.

In every case when getting ready, the valve at the outlet should be opened an instant before connecting the hose. The hose should then be blown out, and then the hose connected to the tool.

Actual Uses of Compressed Air

We now come to the actual uses of compressed air. Aside from the line of standard power-driven machine tools for the boiler shop, such as shears, bending rolls and punches, there are a large number of standard and special air tools fully as important. The principal ones are:

Pneumatic chipping, calking and bending hammers.
Pneumatic long-stroke riveters.
Pneumatic drills.
Pneumatic reamers.
Pneumatic tappers.
Flue expanders.
Flue cutters.
Yoke riveters.
Compression riveters.
Holders on.
Jam riveters.
Rippers.
Rivet busters.
Pneumatic hoists.
Cranes.
Pneumatic jacks.
Scaling tools.
Staybolt rippers.
Telltale hole drillers.
Air forges.
Pneumatic painting machines.
Grinders.

Besides these, there are many other special appliances devised to meet peculiar conditions existing in each case. Limited time necessitates merely mentioning the names of most of these, and only a short review of the most important of these can be given.

First in importance should be mentioned the chipping and riveting hammers. The chipping, calking and bending hammers in six or eight different sizes for every character and weight of work, from the thinnest to the heaviest plates, range in weight from 6 to 16 lb., with strokes from 1 to 5 in., and these striking at from 840 to 3200 per min., with air at 100 lb. pressure, acting on a 1 1/16-in. diameter piston. It would seem that no argument is necessary to prove the advantage of these wonderful labor-saving tools over the old hand methods in the hands of even ordinary unskilled help.

Advantages of Pneumatic Chipping and Calking

Pneumatic chipping is unquestionably many times more powerful and efficient than hand chipping. Further, on account of their being no necessity to "swing a hammer," it is possible to work in out-of-the-way places and corners where hand chipping could only be done with the greatest difficulty. The varying sizes of these tools makes it possible to select a hammer to meet any peculiar set of conditions, and the spring throttle, which is always under the control of the operator, permits an instantaneous adjustment of the blow, from a very light tap to the full power of the hammer, thus enabling intricate chipping to be done quickly. Further, the chipping can be carried very much closer to the finished size than can possibly be done by hand.

When it is considered that an ordinary operator can take a ⅜-in. chip off a ½-in. plate at the rate of 8 in. per min., and this is compared with the time and work which would be required to cut the same chip by hand, some slight idea of the advantage of pneumatic chipping can be gained. It is a conservative statement to say that one man with a pneumatic chipping hammer can do from three to five times as much as he could do by hand.

For calking, the pneumatic hammer is ideal; for, by selecting the proper weight of hammer or throttling the air pressure so as to limit the force of the blow, the metal can be condensed and calked with an evenness impossible with hand methods, and the depth of the compacting of the metal can be regulated to suit conditions. In addition to the ordinary plate chipping and calking, in most boiler shops there are usually iron or steel castings, all sorts of brackets and supports, stack bases and other parts in and around the boiler or boiler settings, all of which need a certain amount of dressing. There are also many other special uses found for the chipping hammer, depending upon the particular shop and the type of boiler being handled.

Features of the Pneumatic Riveting Hammer

The pneumatic riveting hammer of the long-stroke type, weighing from 14 to 21 lb., depending on the class of work for which it is intended, and having from 840 to 1080 blows per min., is a marvelous device, and even in the hands of an inefficient operator does so much more work and does it so much better than could be possibly done by hand that it is inconceivable that any one would tolerate hand riveting of any sort. For any given case experience has pretty conclusively demonstrated that the work can be done in from one-fifth to one-third the time required to do it by hand work, with a proportionate reduction in cost and the very considerable advantage of having the work done better.

The reason for this is almost self-evident. It is not safe to heat a steel rivet beyond a certain point if its fibrous texture is to be retained and the full strength of the rivet made available. If the rivet is driven by hand it will be seen that, no matter how rapidly the riveters strike, they cannot possibly upset and heat the rivet as quickly as it can be done by a machine which strikes a more powerful blow, probably 10 to 20 times faster than any riveter can possibly strike. On this account the rivet fills the hole and is headed before it is cooled to any great extent, and as it cools and is followed up by the riveter, the plates are clamped together tighter than is the case with a hand-driven rivet. Besides, there is less likelihood of the rivet running over and heading up off the center.

It is impossible to imagine any form of working machine simpler in construction than a riveting hammer, consisting as it does of the barrel, valve box and valve, handle and trigger, and while we sometimes hear complaint as to the cost of repairs, such cost is trifling compared with the results obtained. In fact, we do not believe it an exaggeration to say that any good shop has its capacity doubled or tripled by the introduction of pneumatic chippers, riveters and drills.

It is not necessary to occupy space with tabulated results, but statistics are available to show that it is a fact that pneumatic hammers double, triple and ofted quadruple the working capacity of a man or gang, and in addition do the work better than it can be done by hand.

Other Devices for Working on Rivets

Along with pneumatic hammers come, of course, pneumatic holders-on for backing up the rivets; jam riveters for working in restricted places or in flues and other positions where the ordinary riveter cannot be operated; rippers for cutting up tanks, boilers and other plate work; rivet busters for flogging off the heads of rivets and stay bolts, for purposes of repair or absolute dismantling of boilers and tanks, and other special devices of kindred sort, many of which are specially made, having been developed in some particular shop.

Pneumatic compression riveters, either portable or stationary, and yoke riveters of varying design are largely used where the character of work demands this type. When properly mounted so as to be flexible they constitute a very important addition to any boiler shop equipment. In principle the compression riveter is much the same as the ordinary hydraulic riveter, except that the riveting plunger is advanced by means of a toggle or an arrangement of levers in turn moved by a piston moving in a compressed air cylinder.

Yoke riveters, on the contrary, are simply a heavy riveting hammer mounted on a suitable yoke frame, instead

of being held by hand, the toe of the yoke constituting the holder-on. These also are largely used for certain classes of work.

Pneumatic Drills

Pneumatic drills are made in sizes ranging from the smallest midget type, weighing 6 or 7 lb., to the powerful compound gear type having a capacity to drill up to 3 or 4 in. in metal and weighing up to 118 lb. In principle they consist of a multiple cylinder air-actuated engine, driving a crankshaft which is geared to the drill spindle or socket which takes the drill. On the smaller sizes the spindle speed is as high as 2600 rpm., whereas in the larger compound types the spindle speed is as low as 36 rpm.

The power of these drills varies, of course, with the air pressure, but it is astonishing to see how rapidly they work and what enormous power they have. Their absolute flexiblity lends them to all classes of work, and for general drilling, reaming, tapping, flue rolling or cutting out flues from old boilers there is nothing which compares with them. Through their use it has been possible to introduce methods of construction in boiler shops which have worked a revolution in the cost of boilers.

More recently ball bearings have been substituted for the older types of sleeve bearings, and modifications in material made which have reduced the weight and increased the power and life of these drills to a great extent.

In connection with railroad locomotive boilers, rules have been formulated which require the drilling of telltale holes in staybolts, and the small size pneumatic drills are the most desirable tools for this work or for cleaning out these holes as occasion requires.

Scaling tools for removing the scale from the inside of boilers are nothing more than small, light pneumatic tools striking a fairly light blow but having a very high speed and they can accomplish an enormous amount of work in a most satisfactory manner.

Pneumatic Hoists, Cranes and Jacks

Pneumatic hoists and pneumatic geared cranes are largely used in boiler shops for convenience in handling the various parts entering into the construction of boilers in the different stages of their construction from machine to machine, and where air is available a considerable saving in labor can be effected through the use of these devices. The pneumatic cylinder hoist is a direct-lift type and can be furnished in capacities up to 20 tons and for any reasonable lift. Where this type cannot be used, the geared hoist is easily mounted on a hook and swung from a jib crane or may be arranged to travel on the under flanges of an I-beam trolley track. These can be obtained in standard sizes from 1 to 10 tons. They consist of suitable air motor and necessary gearing, together with a drum, all contained in a sturdy frame and suspended from hook or trolley wheels, as the case may be. They are a most desirable adjunct to any boiler shop, and with reasonable care have a long life and make a good showing in every way.

Pneumatic jacks also have a useful field, although not so great as some of the other devices mentioned. In principle they consist of a cylinder with a piston; a heavy piston rod projecting through the top head of the cylinder, the air being admitted to the bottom, the piston moves upward exactly as in the case of a hydraulic jack. These can be obtained in stock sizes from 1 to 20 tons and prove themselves a very useful tool, either for permanent installation in some fixed place as an adjunct to a permanent machine or mounted on wheels for ready movement.

Miscellaneous Air Equipment

Pneumatic forges for rivet heating or tool tempering are light and compact, hence readily transferable, and can be taken close up to where the work is being done, thus insuring hot rivets without burning. They are simple in construction, durable and very efficient, and eliminate any necessity for pumping or grinding a rivet forge.

Pneumatic grinders of several sorts can be obtained, and these are very desirable for finishing edges of plates, corners or for any other special grinding where it is desirable to take the tool to the work. They consist of a standard form of air motor, practically the same as that used in the pneumatic drills, with a suitable extension shaft for mounting on wheels which are made for either face grinding or edge grinding.

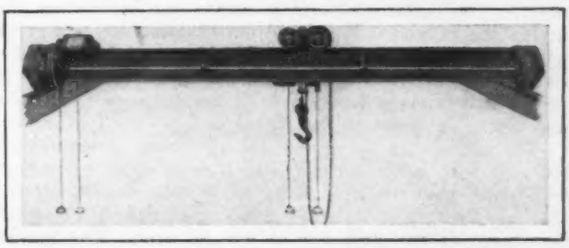
Pneumatic painting or paint sprayers may be used to considerable advantage in and around a boiler shop for painting boilers, tubes, etc., before shipment. In the hands of even an inexperienced operator they do rapid, economical and satisfactory work.

This review of a most comprehensive subject is incomplete, as a paper much longer than the present one could be written on any one of the tools mentioned. However, it is hoped that interest has been aroused and that discussion will be provoked which will bring out special uses and devices that our various members may have found helpful in connection with their own practice.

Small Electric and Hand Power Crane

The Northern Engineering Works, Detroit, Mich., has brought out a combined electric and hand-power crane. It is intended for handling medium loads at moderate speeds, its especial field being for service in foundries, over floors, handling moderately light work, in cleaning and shipping rooms, store houses, machine shops and erecting floors, although if desired it can be used for outdoor work. The crane is built with one, two or three motors, and when any of these are omitted a hand gear operated by a pendent hand chain is substituted. Generally the hoist and the bridge travel are operated by motors and the trolley travel by hand, as is the case with the crane illustrated, although in some cases where the capacity is small, or the span short, the travel motions are both by hand, and a motor is employed on the hoist only.

The double-girder type of construction is employed for the crane bridge, with the trolley traveling on the top



A New Type of Small Capacity Crane with Electric Hoist Built by the Northern Engineering Works, Detroit, Mich.

of the girders. The hoist is suspended on the trolley between the bridge girders, and the inclosed gearing can be bolted or attached to the trolley in such a way as to enable it to be removed and used elsewhere if desired. Wire rope is used and cut gears are employed throughout and are inclosed for internal lubrication. The hoisting and the lowering of the load are by power, and a novel inclosed automatic brake controls the load and holds it in place, while an automatic stop prevents the hook from running into the drop. The hoist used on this crane is also built in a separate self-contained unit, which can be bolted to the trolleys of other cranes.

The crane is made for various capacities ranging from 1 to 6 tons, and the ordinary spans are from 10 to 40 ft. to accommodate the building in which they are to be placed. When the crane is made for hand travel the axles have roller bearings lined in steel cages, but when motor drive is employed the cages are of bronze. Any type of direct or alterating-current crane motor can be furnished.

Furnace Equipment for Pittsburgh Steel Company

The Pittsburgh Steel Company the past week placed the following contracts for equipment in connection with its two new blast furnaces at Monessen, Pa.: Four 3000-kw. turbine generators and condensing equipment, Southwark Foundry & Machine Company, Philadelphia, Crocker-Wheeler generators to be used; plate work of the stoves and cleaners, William P. Pollock Company, Youngstown, Ohio; stove fittings, Pittsburgh Valve, Foundry & Construction Company, Pittsburgh; 8500-hp. Sterling boilers in 17 500-hp. units, Babcock & Wilcox Company, Barberton, Ohio; water purifying plant, Kennicott Company, Chicago; feed water heater, Elliott Company, Pittsburgh; boiler feed pumps, Wilson-Snyder Mfg. Company, Pittsburgh.

An Improved Drill Socket

A new type of drill socket to which the name Wear-Ever has been given has been placed on the market by Scully-Jones & Co., 316 Railway Exchange Building, Chicago, Ill. Some of the special features are a reinforcing collar around the base and capacity to nest.

The Wear-Ever Drill Socket Manufactured by Scully-Jones & Co., Chicago, Ill.

The socket is made in one solid piece of special steel which has been heat treated, hardened and ground. It has a key on the inside and a keyway on the outside which extends almost the entire length of the socket, an arrangement which, it is emphasized, gives positive body drive and entirely eliminates twisting of tangs either on the drill which is being driven or the socket itself. The keyway also forms the body drive for the sockets when they are nested, an arrangement which does away with twisting at the spline.

The collar or reinforcement around the base serves to increase the strength and life of the socket, and to do away with the flaring of the socket at the base when being used in heavy service, when it is difficult, if not impossible, to keep the drill in place. The collar provides a means for separating the nested socket, and it is pointed out that this saves a great amount of time in changing. If, for example, it is desired to take a No. 1 or 2 socket out of a No. 4 or 5 it is simply necessary to insert a drift key between the No. 1 and No. 2 or between the No. 2 and 3.

The socket can be nested not only with its own kind but also with other sockets, and it is possible to use up drills that have twisted tangs or broken shanks, as all that is necessary is to grind a flat spot or mill a key on the shank of the drill and it can be used. The socket has a standard taper both inside and out, and will fit in the spindle of all drilling machines.

Electric Driving of Rolling Mills

An extended paper on the electric driving of rolling mills was read before the Institute of Electrical Engineers of England on January 11 by C. Antony Ablett. It had, of course, much to do with schemes for regulating the electrical features of the drive, but some of the observations on the action of motor and flywheel may be mentioned. For example, it is explained that while the use of a flywheel in conjunction with an electric motor presupposes the necessity for reducing speed when the demand for power is great, the point requires a little consideration. The ordinary direct-current shunt-wound motor, or three-phase induction motor running at light load, will fall in speed by, say, 2 per cent. when it is required to give its full power. The stored energy of the flywheel varies as the square of the speed at which it is running, so that if a flywheel were used in conjunction with this motor it would only give up 4 per cent. of its stored energy as the power increases from light load to the full power of the motor.

Continuing this argument further, the author supposes that a rolling mill requires during a pass a power equivalent to four times the normal full-load power of the motor for a few seconds. Commercial motors will not give more than twice the normal full-load power for a few seconds without being liable to injury, and to prevent this the circuit breaker is usually set to open at the current corresponding to this power. The flywheel, therefore, has to furnish the power which is in excess of that which the motor can give. In the case considered, the motor would fall perhaps 5 or 6 per cent. in speed when the power increased from light load to double full-load power, so that the flywheel would only give up 10 or 12 per cent. of its stored energy. The flywheel would have to be abnormally heavy, or else, if one of a weight within the bounds of commercial possibility were adopted, the combination would be unable to cope with this demand for power, and the motor power would increase until the circuit breaker opened.

It is therefore necessary artificially to increase the fall in speed of the motor as the power which it has to give increases. If the speed falls by, say, 10 per cent. as the power increases from zero to full load, and, say, by 22 per cent. as the power increases to the double full-load power, the flywheel would have given up 39 per cent. of its stored energy by the time that the motor was giving double its normal full-load power, instead of from 10 to 12 per cent. A flywheel, therefore, of moderate weight would materially assist the motor in overcoming heavy demands for power which last for a short time only.

There are two possible devices for artificially increasing the fall in the speed of the motor as the power demanded increases. These are commonly spoken of as: (1) The permanent slip regulator. (2) The automatic or intermittent slip regulator.

The author holds the opinion that insufficient attention is paid to the question of friction in the pinion housings and on the roll necks, and thinks that improvements might be effected which would reduce this friction, and that any such improvements would materially reduce the cost of rolling. In many mills the power consumed by the friction of the mill itself is about one-fifth or one-sixth of the normal rated output of the motor which is installed to drive the mill, so that nearly 50 per cent. of the units of electricity used per ton rolled are wasted in friction. This shows how great an opportunity there is for improvements for effecting economies in the cost of rolling.

The large waste of power caused by rope drives where the friction is independent of the power transmitted does not apply to the same extent to the gear drive, because the pressure between the teeth, and hence a greater part of the friction, is dependent on the amount of power transmitted. When a small power is transmitted the friction loss is reduced, so that with a gear drive the units of electricity consumed on the overcoming friction do not form so large a proportion of the total number of units consumed as with a rope drive.

In certain mills, particularly in brass and copper sheet mills, long trains of gearing are usually used for transmitting the power of the motor to the rolls, and are so arranged that the power for the more distant mills is, perhaps, transmitted through ten different pairs of gear wheels. A more wasteful way of applying power could hardly be imagined.

Cleveland Superintendents Interchange Visits

The Cleveland Branch, National Metal Trades Association, is effecting plans to inaugurate an efficiency campaign by having the various superintendents and foremen visit the plants of the other members of the association during the year. Different days will be allotted each month in which a certain number of superintendents and foremen from a number of factories can visit other specified factories. This plan for bringing shop superintendents and foremen in closer touch and to enable them to obtain information that would be of assistance by visiting other shops was proposed by C. B. Willson, the new president, at the recent annual meeting of the Cleveland Branch.

The annual meeting of the Temple Iron Company, Temple, Pa., was held in Reading, March 16. The following directors were elected: George F. Baer, president Philadelphia & Reading Railroad; E. T. Stotesbury, Philadelphia; E. B. Thomas, president Lehigh Valley Railroad; F. D. Underwood, president Erie Railroad; Albert Broden, superintendent blast furnaces Reading Iron Company; W. H. Truesdale, president Delaware, Lackawanna & Western Railroad; Thomas P. Fowler, president New York, Susquehanna & Western Railroad; F. C. Smink and W. J. Richards, general manager Philadelphia & Reading Coal & Iron Company. George F. Baer was elected president.

The Society of Automobile Engineers, now located at 1451 Broadway, New York City, will remove about May 1 to the new building of the United States Rubber Company at the corner of Broadway and Fifty-eighth street. The location will be on the twelfth floor.

Rail Production in 1911

A Decline of 813,241 Tons from 1910

The American Iron and Steel Association has collected from the manufacturers and publishes in its Bulletin the statistics of rail production in the United States in 1911, as follows:

The production of all kinds of rails amounted to 2,822,790 gross tons, against 3,636,031 tons in 1910, a decrease of 813,241 tons, or over 22.3 per cent. Rails rolled from purchased blooms, crop ends and "seconds" and rerolled and renewed steel rails are included. Included in the total for 1911 are 205,409 tons of girder and high T steel rails for electric and street railroads. In the following table the production of all kinds of rails is given for 1911:

States Gross tons	Bessemer steel	Open-hearth steel	Miscellaneous rails	Total gross tons
Pennsylvania	362,435	477,228	....	839,663
Other States	776,198	1,199,695	7,234	1,983,127
Total	1,138,633	1,676,923	7,234	2,822,790

Included in the 7234 tons of miscellaneous rails rolled in 1911 are 234 tons of iron rails, 462 tons of rails rolled from electric steel and 6538 tons of rerolled steel rails which the makers were unable to classify as Bessemer or open-hearth rails.

Of the total production of steel rails in 1911 2,708,795 tons were rolled from ingots made by the makers and 113,761 tons were rolled from purchased ingots or blooms, crop ends, "seconds" or renewed or rerolled rails.

Bessemer Steel Rails.

The production of Bessemer steel rails in 1911 amounted to 1,138,633 tons, against 1,884,442 tons in 1910, a decrease of 745,809 tons, or over 39.5 per cent. Of the total in 1911, 1,053,420 tons were rolled by makers of ingots and 85,213 tons by companies which did not operate Bessemer converters. Included in the total by makers of ingots are 19,379 tons of rerolled rails. The following table gives the total production by States from 1908 to 1911 in gross tons:

Bessemer rails	1908	1909	1910	1911
Pennsylvania	315,547	553,719	591,473	362,435
Other States	1,033,606	1,213,452	1,292,969	776,198
Total	1,349,153	1,767,171	1,884,442	1,138,633

Open Hearth Steel Rails.

The production of open-hearth steel rails in 1911 was 1,676,923 tons, against 1,751,359 tons in 1910, a decrease of 74,436 tons, or over 4.2 per cent. Almost all the open-hearth rails in 1911 were rolled from basic steel and all were rolled by producers of open-hearth ingots. The following table gives the production of open-hearth rails since 1908:

States, gross tons	1908	1909	1910	1911
N. Y., N. J., Pa.	184,059	335,856	445,139	579,924
Md., Ala., Ohio	387,732	344,842	570,878	509,950
Ind., Ill., Col., and California		575,976	735,342	587,049
Total	571,791	1,256,674	1,751,359	1,676,923

Weight of All Kinds of Rails.

The following table gives the production of all kinds of rails in 1911 according to the weight of the rails per yard, girder and high T-rails for street and electric railroads included:

Kinds of rails	Under 45 pounds	45 pounds and less than 85	85 pounds and over	Total, gross tons
Bessemer rails	111,231	606,300	421,102	1,138,633
Open-hearth rails	100,755	461,387	1,114,781	1,676,923
Miscellaneous	6,772	9	453	7,234
Total in 1911	218,758	1,067,696	1,536,336	2,822,790
Total in 1910	260,709	1,275,339	2,099,983	3,636,031
Total in 1909	255,726	1,024,856	1,743,263	3,023,845
Total in 1908	183,869	687,632	1,049,514	1,921,015
Total in 1907	295,838	1,569,985	1,767,831	3,633,654

The maximum production of all kinds of rails was reached in 1906, when 3,977,887 tons were rolled.

The Bond Foundry & Machine Company, power transmitting machinery, Manheim, Lancaster County, Pa., is making a foundry addition to its works, the size of which will be about 160 ft. long and 75 ft. wide.

Securing Good Castings for Dodge Products

The Dodge Mfg. Company, Mishawaka, Ind., recognizing the fact that the utmost care should be taken in securing the strength of its transmission appliances, maintains a well equipped chemical laboratory. In this laboratory all the various raw materials are analyzed, particularly the pig iron used in the foundry. The composition of the iron is carefully ascertained before going into the cupola, and none but the best procurable is used. Although the purchases are made on a guarantee of chemical constituents, each car on being unloaded is sampled for analysis and the iron remains unused until the report from the company's own chemist shows the exact elements of which it is composed. A proper combination is then laid out from the various irons to secure the best mixture for the work in hand. Some mixtures are high in silicon for soft special castings; some are low in silicon and high in manganese for harder castings. Each mixture, however, is properly proportioned for the work it eventually has to perform.

In charging the cupola, the iron is carefully weighed in the yard, a scale car with a box on it passing from pile to pile of pig iron and getting portions from one pile or another, as the case may demand, to make the proper mixture. These boxes are then hoisted to the charging floor with an electric crane and are stacked ready for use in the charging room.

To insure the results in Dodge products, after all care is taken with the composition of raw materials going into the cupola, test bars are taken from the metal coming out, and the final answer to these elaborate preparations is secured. Bars testing 1800 lb. tensile strength to the square inch are considered good by the average foundry, but no metal is considered right for Dodge products unless the test bars show 2200 lb.

The World's Export Machinery Trade

An article giving interesting figures regarding the export machinery trade of the world is published in Commercial America, issued by the Philadelphia Commercial Museum. From this article the following table is taken, showing the value of the exports of machinery from the leading nations for certain years:

Countries.	1890.	1900.	1910.
Great Britain	$79,800,000	$95,300,000	$142,500,000
Germany	15,700,000	54,700,000	119,000,000
United States	15,400,000	69,100,000	110,600,000
France	9,100,000	.....	19,900,000
Belgium	8,000,000	.....	12,300,000
Switzerland	4,000,000	.....	14,000,000
Netherlands	3,000,000	.....	6,200,000
All other	5,000,000	.....	43,500,000

From other details published in connection with this statement, the presumption is strong that the compiler of the figures was careful to include in the amounts credited to each country the classification of the same articles as machinery.

The total value of the exports of machinery from all countries in 1890 is placed at $140,000,000 and in 1910 at $468,000,000. These figures indicate that the advance in the foreign trade in machinery is one of the most striking features of the great expansion of the world's commerce. Much greater progress, relatively, was made by Germany and the United States than by Great Britain. It is interesting to observe that the United States made a greater gain from 1890 to 1900 than Germany, but that in the decade from 1900 to 1910 the positions of these two countries were reversed, Germany taking the lead.

The National Founders' Headquarters

The National Founders' Association has arranged to move its offices, which are now at Detroit, and combine them with the office at Chicago, making Chicago the permanent headquarters. The change will be made about April 20, and the Chicago address will be 29 South La Salle street. J. M. Taylor, secretary, will remove to Chicago. This plan will bring Mr. Taylor and A. E. McClintock, who has been located in Chicago for the past six years as commissioner, into much closer association and will establish headquarters much more convenient for the president, O. P. Briggs, to reach from his Minneapolis home.

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Commissioner Prouty's Significant Words

Before the Traffic Club of Pittsburgh last Thursday night Charles A. Prouty, chairman of the Interstate Commerce Commission, delivered an address remarkable in many ways. By graceful illustration, drawn from his early career, Mr. Prouty indicated what a wonderful thing it was that he as an individual had been raised to the position of chairman of the body which regulates the railroad charges of the country and then suggested that the significant thing was not that he should be chairman of the Interstate Commerce Commission, but that there should be an Interstate Commerce Commission at all. In such reminiscent vein Mr. Prouty might have gone farther and suggested how wonderful it was, granting that there was a commission and that he was its chairman, that the railroad managers should invite him to dine with them!

The function of the courts, Mr. Prouty maintains, is only to stand between the railroads and confiscation. The Supreme Court has held that the making of a railroad rate is a legislative act, and there is a wide zone between a reasonable rate on the one side and confiscation on the other. Clearly he does not admit that to reduce a rate is a direct step toward confiscation when it merely reduces the return upon capital invested. In other words, it is a legislative and not a judicial act to determine what should be the return upon capital invested in railroad enterprises. Mr. Prouty says:

> In the past the courts have persisted in invading the legislative domain, but this will not, I think, be permanently permitted. There can be no intelligent review of a legislative act by judicial process. There can be no effective regulation of railroad rates so long as the administrative acts of the regulating body can be reviewed by the courts. Ultimately the legislature will be left supreme in that domain where the exercise of legislative judgment is required.
>
> This means that the court can stand between the railroad and confiscation, but that it will not be allowed to determine how profitable the railroad investment shall be, for that is not the business of a court. In all that vast realm covered by the word reasonable, within that zone bounded by confiscation on one side and a reasonable rate on the other, the legislature will dominate.

In the spring of 1897 the Supreme Court handed down its decision in the Maximum Rate case, holding that the Commission had no authority to prescribe a maximum rate. Mr. Prouty, who had become a commissioner a few months before, wrote a magazine article, taking the ground that there could be no regulation of the interstate railroad rates without the exercise of that power, and, using Mr. Prouty's words last Thursday night, the views he then expressed "were bitterly condemned by almost every leading newspaper east of the Mississippi and north of the Potomac and Ohio rivers as socialistic and impossible."

That which fifteen years ago was condemned, and much more than that, has been converted into actual practice. The condemnation was written in the year succeeding that in which Mr. Bryan almost swept the country with his free silver propaganda, so that we can hardly regard it as a particularly reactionary or conservative period in our history. It is well to pause for a moment and observe that what is called socialistic at one time may within much less than a generation come to be considered perfectly sane and democratic.

With the incident before us, there is good ground for our taking seriously certain of Mr. Prouty's utterances at this later and riper stage of his observation.

He points out that the power of the courts to stand between a railroad and confiscation is the power granted by a written constitution:

If it becomes clearly apparent that in its present form our constitution lends itself to injustice and prevents the accomplishment of the right, then it will in due time be changed. I have for a long time thought that the outcome of all this conflict between legislature and court was likely to be an amendment to our constitution depriving the court of all power to set aside a legislative enactment dealing with private monopoly.

As railroad investments have been made more safe, and are to be made still safer in future, the required return upon them becomes less, as with all investments the two elements stand in inverse ratio with each other. Should the time ever come that the tendency would be to restrict unreasonably the return upon railroad investments then no property is likely to be of much value.

In forecasting the railroad future, Mr. Prouty feels that the most active storm center is the labor situation. Assuming a case, that labor demands an advance and the railroads grant it, in turn coming to the Interstate Commerce Commission for leave to advance rates in order to recoup:

The railroad rate is paid by the whole body of the public. If, therefore, this increase in wages was unjustifiable, and if on that account an increase in rate is allowed it results that the general public, including all other forms of labor, is required to pay what is unjust and unreasonable. Must not, therefore, the Government be satisfied, not only that the added wages are paid by the railroads but that they are necessarily and properly paid? And is not the railroad thus placed in a most unfortunate and embarrassing dilemma?

After referring to the "embarrassing dilemma," Mr. Prouty becomes guarded in his speech, yet suggestive. The Erdman act, he points out, is only a peace measure, obligatory on neither side, and he had long thought that at least there should be compulsory arbitration to the extent that no strike could be declared until a given time after an award should be made, the force of public opinion perhaps being sufficient to prevent such a strike, once an award had been made. At any rate, it was clearly desirable that there should be a form of settling these labor matters so that the Interstate Commerce Commission should only have the task of determining whether rates should be adjusted to a wage advance, in cases where a wage advance was justifiable. In other words, speaking simply for the Commission, he would have some plan mapped out whereby the railroads would not be forced to make an unjust advance in wages, in order to preclude their asking permission to advance their rates, based upon such an unjust wage advance.

We are of the opinion that something, radical perhaps from the present viewpoint, but probably by no means radical from the viewpoint of a decade hence, having in mind all that has occurred in the past fifteen years, will have to be done in the railroad wage matter. In many respects the question stands alone. When a wage issue is raised in a manufacturing industry there are cognate industries, the rate in which may be compared with the rates at issue. Such is not the case in railroading. In any manufacturing industry an interruption to production is a more or less serious matter; but in none is it of such vital consequence as an interruption to traffic, for such interruption is equivalent to a cessation of manifold activities. But of paramount importance is this feature, that in the case of any ordinary employer the ability to pay the advanced wage demanded is of the most fundamental importance, whereas in the case of the railroads this question cannot really be said to enter, because what the railroads can or cannot afford to pay is purely for the Interstate Commerce Commission to decide. Either the question of railroad wage regulation must be taken up in some form by the Government or it will insidiously be forced upon the Commission, clearly to its embarrassment and to the detriment of the good work it is now doing.

A Self-Corrective in Patent Monopoly

An opportunity for fostering a monopoly may commonly be pursued too far if profitable business of good proportions is the object. If the monopoly is offered by a license agreement, as seems to be the general opinion through the decision of the United States Supreme Court in relation to the Dick mimeograph case, then the indefinite expansion of the exclusive business is automatically checked by the restrictions by which the transactions are surrounded. This is not to say that monopoly cannot develop under the protection of the law, but that the condition is remote. Nor is this an argument against a public demand for a reconsideration of the decision or a modification of the law, for when a manufacturer sells a product containing a printed license agreement it is not certain his salesman will always emphasize the existence of the agreement in closing a difficult sale. A little by way of particularization will help:

A patent not only gives the inventor the right to make, use or sell the invention to the extent which he desires, but also gives him the right if he wishes to prevent anyone else from making or using the invention in any way. During the 17-year term of his patent there is no doubt as to the legal right of a patentee to decline to make any use whatever of his invention and to prevent any one else from making any use of it or getting any advantage whatever from the advance which he has made. This right of the patentee to prevent any use of his invention during the patent term has been repeatedly announced by the courts and was affirmed by the United States Supreme Court in the paper bag patent case decided in 1907 in which the unfairness and unreasonableness of the patentee in preventing any advantage being taken of the invention were unsuccessfully urged as reasons for allowing others to use the invention.

A patentee has the right to allow chosen manufacturers to produce the patented goods under a license arrangement and to prevent others from doing so. With such patent license agreements the price of the patented article is sometimes controlled in order to promote the high grade and reliable quality of the patented articles by taking away from the manufacturers the necessity or incentive to use poor materials or workmanship.

The right of the patentee to control the price of things less directly connected with the patent is not so definite. Where there is no direct or reasonable connection between the patent and the price control the logical justification for such control disappears. For instance, it would hardly be considered reasonable to attempt to control the price of unpatented articles which had been simply ornamented to an insignificant

extent with patented gilding. A similar situation might arise in the case of phonographs on which the main patent had expired and which were merely provided with an operating handle of special patented construction. There seems little danger that the American people would allow themselves to be seriously hampered in such ways. Their ingenuity can safely be trusted to handle such situations, especially with the active incentive of modern competition. To take the above examples, the dealer who wished to avoid price restrictions on such articles could very easily remove the insignificant patented features which would unquestionably leave them free from any patent control. Indeed, in the past rival manufacturers and dealers have certainly adopted every legitimate means for avoiding burdensome patent monopolies.

Other unusual or unreasonable attempts to expand the scope of a patent monopoly become commercially ineffective. The patentee who will only sell his machines for excessive prices or under unusual conditions is hastening the day when some other inventor will develop a rival machine and destroy the value of the patent. Very few inventions are indispensable and it is an unusually valuable advance which can commercially hold an industry for anywhere near the full 17 years of the patent term, or, as it is commonly put, "It's a mighty good patent that really lasts 10 years." Even aside from these considerations it is usually poor business policy to impose onerous conditions on the use of patented articles, since much better returns can be secured by promoting their use at reasonable rates than making the prices so high as to greatly diminish the demand. Taking such a license arrangement as that used by the Dick Company in connection with its mimeographs where the purchasers were restricted to the use of the special wax-stencil paper and ink supplied by the Dick concern, there is a good deal to be said against such a system from the purely business standpoint.

The 1911 Rail Production

Production of rails in the United States in 1911 amounted to 2,822,790 gross tons, 22.3 per cent. less than the 3,636,031 tons of 1910, and 30 per cent. less than the 3,977,887 tons of 1906, which was the banner year for rail production. Barring 1904 and 1908, which were decidedly "off" years, the 1911 rail production is the smallest since 1900, and exceeds the production of 1887, which held the banner for a round dozen years, by no more than 32 per cent.

There is no occasion for surprise at the smallness of last year's production, even considering that the exports of 420,874 tons made a new record, for the year was a small one for the building of new road, and the railroads were not active in replacement work. The statistics of the Railway Age Gazette, presented at the close of the year, showed only 3066 miles of new road, the smallest since 1897, and contrasting with the maximum in the intervening period, of 6026 miles in 1902. This, of course, is mileage of road, not mileage of track. A reference to Poor's statistics for previous years shows that in a decade the building of track was almost precisely double the extension of main line, and one may therefore hazard a guess that the new track laid in 1911 was not far from 6000 miles, which in 85-lb. rails would involve 800,000 tons.

Included in the 1911 total of 2,822,790 tons of all classes of rails were 205,409 tons of girder and high T rails, and 218,758 tons of rails under 45-lb., used entirely, of course, for industrial purposes. The exports, as noted, were 420,874 tons, this including a portion of the light rails. This would leave approximately 2,000,000 tons of ordinary standard rails, of which a considerable tonnage was used for industrial purposes and for electric lines not using special rails. Such exceptional use may have reached 200,000 tons, and on such an assumption it may be suggested as a rough approximation that the regular steam roads used about 1,000,000 tons of rails for replacement purposes and about 800,000 tons for new construction. The tonnage is as likely to have been under as over that amount, which represents a trifle less than two-thirds of the total production.

This tonnage would lay 13,000 or 14,000 miles of track in 85-lb. rails, and this is less than 4 per cent. of the total steam railroad track in the country. It would be interesting to speculate upon the proportion of the total rail production of 1911 which found its way to the track upon which high speed trains are run. The proportion was certainly very small. There is about 360,000 miles of steam railroad track in the country, but less than 250,000 miles of road. Only a relatively small proportion of this total of railroad carries high-speed trains. For illustration, there is only 20,000 miles of railroad in the country equipped with automatic block signals, and almost one-half of this is on single track road. It is perfectly obvious, then, that the extreme requirements of safety, as illustrated by the requirements of high speed track, really involve only a very small proportion of the total tonnage of rails produced in the United States; and it is strange indeed that more attention is not paid, in the current discussion of rail quality and rail wear, to this very important quantitative fact.

The production of rails at the Gary plant of the United States Steel Corporation in 1911 was 281,980 tons, or precisely 10 per cent. of the total production of the country. In 1910, when all tonnages were larger, the Gary plant proportion was 12 per cent.

The Metal Trades Convention Programme

The programme for the fourteenth annual convention of the National Metal Trades Association, to be held at the Hotel Astor, New York City, April 11, has just been issued. A morning and afternoon session will be held, and in case the business is not then concluded a session will be held the following day. The convention banquet will be held at Hotel Astor Thursday evening. On Thursday afternoon a tea will be given to the ladies who accompany the members.

At the morning session convention committees will be appointed, after which the officers will make their annual reports. The report of Treasurer Howard P. Eells will show that the finances of the association are in better shape than ever before, despite the activities of the past year. Two reports of standing committees will be submitted. One on Systematic Compensation for Industrial Accidents will be read by Henry D. Sharpe, vice-chairman. Frederick A. Geier, chairman, will submit a report on Industrial Education. At the opening of the afternoon session William H. Doolittle, National Metal Trades Association Safety Inspector, will give an address on "Prevention of Industrial Accidents." He will offer practical suggestions for saving lives. His talk will be illustrated with stereopticon views. A general discussion of the subject will follow. An address on "What Has Been Done up to the Present Time and Is Now Doing in Employers' Liability and Workmen's Compensation" will

be made by Miles M. Dawson, an actuary of New York City. This will be followed by a discussion. Joseph J. Feely, Boston, Mass., will discuss "How Far Must Business Yield to the Demands of Industrial Combinations?" Members will also take part in the discussion of this topic. The convention will close with reports of the various committees and the election and installation of officers.

At the annual banquet Thursday evening speeches will be made by Franklin Mac Veagh, Secretary of the Treasury; former Congressman Charles E. Littlefield of New York City; W. Morgan Shuster, former treasurer of Persia, and others.

Meetings of Mechanical Engineers

The spring meeting of the American Society of Mechanical Engineers will be held in Cleveland, Ohio, May 28 to 31, inclusive. The subjects that will come up for discussion at the professional sessions include recent developments in steam turbines, both here and abroad; modern flour-milling processes; important advances in the analysis of steam engine performance; hydraulic governing; recent data on the thermal properties of steam; data on the temperature of condensing water reservoirs, and discoveries and new processes in chilling cast iron.

The next monthly meeting in New York will be held April 9 in the Engineering Societies Building. The Commission of the German Museum of Munich of masterpieces of natural science and technical sciences is to be entertained. The commission comprises Dr. O. von Miller, member of the House of Lords of Bavaria and president Verein deutscher Ingenieure; Dr. Count von Podevils-Durniz, former secretary of State of Bavaria; Dr. W. von Borscht, lord mayor of Munich and privy court counsellor; Dr. W. von Dyck, privy counsellor and professor emeritus of the Munich Technical University; Herr Ph. Gelius, architect of the museum, and Herr Alex. Schirmann, director of the library of the museum. Honorary membership is to be conferred on Dr. Diesel at a meeting to be held in April in the Engineering Societies Building.

Meeting on Manufacturing Costs

Members of the society in New Haven have arranged a meeting for Wednesday, April 17, with afternoon and evening sessions. These will be held in the Mason Laboratory of Mechanical Engineering of the Sheffield Scientific School, and the general topic for discussion will be manufacturing costs. The afternoon sessions will be devoted to the development of manufacturing in New England, covering the production of hardware, firearms, typewriters, machine tools and brass goods. In the evening the question to be brought forward for discussion will be the extent to which scientific management is applicable to small industries. Dinner will be served at six o'clock in the Yale Dining Club.

Spring Meeting in 1915 in San Francisco

The Council of the society has passed a resolution accepting an invitation to hold the spring meeting in 1915 in San Francisco in connection with the Panama-Pacific Exposition.

Bituminous Coal Settlement Reached

The announcement comes from Cleveland that an agreement has been reached in the bituminous labor conferences. The agreement is a compromise and practically cuts the demands of the men in half. Since the controversy began the miners have been asking for twice as much as they now accept, while the operators refused to give anything. The terms of settlement provide for the following wage increases:

Five cents a ton for mining lump coal; 3 cents a ton for mining all other coal; 5 26/100 per cent. increase for men paid by the day.

In the compromise suggested by the bituminous miners' leaders, the demands for a seven-hour day and for a five-hour day on Saturdays, with full pay, were waived.

The compromise is still subject to ratification by vote of the miners concerned, but this is regarded as little more than a formality. There will be a brief suspension of work pending the vote. The settlement directly affects only the bituminous fields of western Pennsylvania, Ohio, Indiana and Illinois, as these only were represented at the Cleveland conference. There seems to be every likelihood, however, that affairs in the other unionized bituminous fields will be adjusted on the same basis.

The Frick Coke Company Advances Wages

On March 30 the H. C. Frick Coke Company posted notices at all its ovens in the Connellsville region notifying employees of an average advance in wages of 7½ per cent., effective April 1. Its last previous advance was made January 10, 1910, and was effective from January 16, the company at that time restoring the rates of wages paid prior to January 1, 1908. This action will be followed by most of the other coke producers, a number of whom have already posted notices of a similar advance.

The company has a total of about 21,000 ovens in the Connellsville coke regions, of which 85 per cent. are in operation. It also owns about 2160 ovens in the Pocahontas region, but is only operating about one-third of them, shipping upward of 13,000 tons of coal per day from this district to the by-product ovens of the Illinois Steel Company at Joliet, Ill., and the Indiana Steel Company at Gary, Ind.

Frost Bolt Business Sold

The Estate of L. D. Frost, or Frost bolt business, at Marion, Conn., was taken over April 1 by its neighbor, the Clark Bros. Bolt Company, Milldale, Conn., after an uninterrupted existence of 70 years. Marion, a small village in the central portion of the State, enjoys the distinction of being the first locality in the country where carriage bolts were made by machinery and marketed. This was in 1838, the pioneers being Rugg & Barnes. Four years later L. B. Frost of the same place caught the manufacturing spirit of the locality and embarked in the manufacture of carriage bolts and founded a business that has continued to the present time. The changes that can come to a business of such long standing are shown as follows: 1842, L. B. Frost; 1844, L. B. Frost & Son; 1848, Frost, Moss & Co.; 1851, L. B. Frost & Sons; 1850, Frost Bros. & Co.; 1866, Frost & Thorpe; 1871, Levi D. Frost; 1883, L. D. Frost & Sons; 1899, L. D. Frost & Son; 1900, Estate of L. D. Frost; 1912, Clark Bros. Bolt Company.

It might also be said that its successor, the Clark Bros. Bolt Company, Milldale, Conn., is among the pioneers in the bolt industry, dating back to 1850. This company's business has grown to a point where it is now classed as one of the largest bolt manufacturers in New England. A well-equipped and modern plant was erected in 1911 in addition to the old works, and the company is now making a very complete line of bolts, nuts, screws, etc.

Elyria Iron & Steel Company Changes Hands

Control of the property of the Elyria Iron & Steel Company, Elyria, Ohio, has been sold by W. S. Miller and associates to the Realty Guarantee & Trust Company, Youngstown, Ohio. Mr. Miller will retire as president and will be succeeded by Hugh B. Wick, who has been vice-president and treasurer. Mr. Wick and his father, Henry Wick of Youngstown, have been interested in the company for several years. The company has a capital stock of $500,000 and manufacture railroad tie plates and spikes, structural high carbon steel tubing, agricultural implement shapes, high carbon steel angles and other products. It has under construction some plant extensions which will be completed within the next 60 days.

A stockholders' committee of the Bon Air Coal & Iron Company, Nashville, Tenn., is sending out a letter to the stockholders presenting a plan for the reorganization of the company. It is stated in the letter that the operations of the plant since it has been in the hands of a receiver have shown a profit.

The Wisconsin Steel Company, subsidiary of the International Harvester Company, is now shipping coke from its ovens in Harlan County, Ky., this being the first output of the battery of 140 ovens recently started. The town of Benham is being built by the company.

Pig Iron Production

A Remarkable Gain in March

Steel Works Furnaces Make an Increase of 5480 Tons a Day Over February

All the steel companies, and particularly the United States Steel Corporation, seem to have set out for a heavy production of pig iron in March. Our returns, which by the prompt co-operation of the furnace companies were in hand on the second day of the month—a record without precedent—show an output of 2,405,318 tons of coke and anthracite iron last month, against 2,100,815 tons in February. The daily average was thus 77,591 tons, against 72,442 tons in February, a gain of 5,150 tons, which is remarkable considering that the number of furnaces in blast April 1 was only 5 more than on March 1. Weather conditions were more favorable than in February, and at many plants every effort was put forth to make a record. The March total is the greatest for any month in two years, that of April, 1910, having been 2,483,763. Pig iron production on April 1, based on the performance of March, was at the rate of 77,887 tons a day for 238 furnaces, against 73,641 tons a day for 233 furnaces at the opening of March. Estimating charcoal iron, this represents a yearly output of 28,700,000 tons, or 1,400,000 tons a year more than the high record of 27,300,000 tons made in 1910.

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, beginning with March, 1911, is as follows:

Daily Rate of Pig Iron Production by Months—Gross Tons.

	Steel works.	Merchant.	Total.
March, 1911	48,970	21,066	70,036
April	47,805	21,031	68,836
May	42,270	18,809	61,079
June	42,708	16,877	59,585
July	42,472	15,369	57,841
August	47,120	15,030	62,150
September	49,696	16,207	65,903
October	50,351	17,460	67,811
November	48,430	18,218	66,648
December	46,885	19,027	65,912
January, 1912	47,844	18,540	66,384
February	53,482	18,960	72,442
March	58,961	18,630	77,591

Output by Districts

The accompanying table gives the production of all coke and anthracite furnaces in March and the four months preceding:

Monthly Pig Iron Production—Gross Tons.

	Nov. (30 days)	Dec. (31 days)	Jan. (31 days)	Feb. (29 days)	Mar. (31 days)
New York	122,051	126,687	118,783	119,420	148,176
New Jersey	.....	.....	.....	.....	.....
Lehigh Valley	78,379	73,085	66,497	70,185	79,866
Schuylkill Valley	59,058	68,373	70,323	64,817	63,787
Lower Susquehanna and Lebanon Val.	40,158	39,818	41,334	41,169	41,780
Pittsburgh district	478,623	474,266	495,099	525,445	623,450
Shenango Valley	95,205	99,483	117,987	118,163	121,923
West. Penn.	87,689	103,138	106,708	109,552	123,234
Maryland, Virginia and Kentucky	51,659	48,501	45,716	38,393	39,215
Wheeling district	91,172	104,549	121,561	117,599	124,108
Mahoning Valley	208,991	210,903	218,221	224,200	254,876
Central and North Ohio	137,796	141,341	140,022	159,562	192,797
Hocking Valley, Hanging Rock and S. W. Ohio.	22,089	23,680	32,495	34,627	37,875
Chicago district	288,274	268,362	245,046	250,333	306,017
Mich., Minn., Mo., Wis. Col., Wash.	58,398	73,707	69,351	65,192	70,300
Alabama	153,901	161,884	145,830	137,720	149,931
Tenn., Georgia and Texas	25,990	25,493	22,938	24,438	28,073
Total	1,999,433	2,043,270	2,057,911	2,100,815	2,405,318

Production of Steel Companies

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in these figures, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons.

	Pig. Total production.			Spiegeleisen and ferromanganese,		
	1910	1911	1912	1910	1911	1912
January	1,773,201	1,128,448	1,483,153	19,538	8,360	22,622
February	1,620,539	1,185,782	1,550,995	21,396	12,821	15,950
March	1,739,212	1,518,063	1,827,792	25,591	11,784	11,538
April	1,669,898	1,434,142	.....	22,304	10,657	.....
May	1,619,283	1,310,378	.....	26,529	13,641	.....
June	1,549,112	1,281,241	.....	27,680	22,611	.....
July	1,462,689	1,316,646	.....	22,924	17,067	.....
August	1,442,572	1,460,610	.....	25,756	14,579	.....
September	1,410,221	1,490,898	.....	15,151	17,757	.....
October	1,419,624	1,560,884	.....	8,500	19,697	.....
November	1,242,804	1,452,907	.....	9,032	19,678	.....
December	1,113,174	1,453,446	.....	12,178	20,698	.....

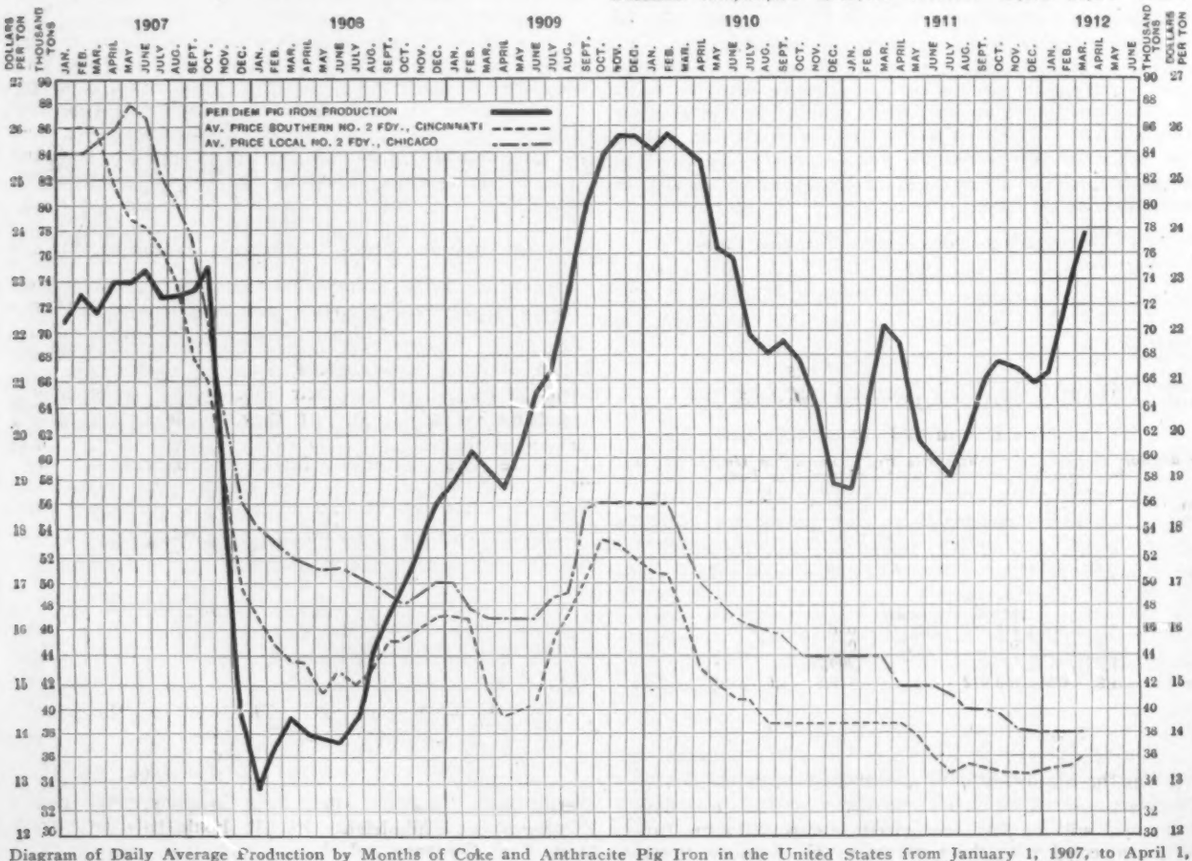


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to April 1, 1912; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

Capacity in Blast April 1 and March 1

The following table shows the daily capacity of furnaces in blast April 1 and March 1:

Coke and Anthracite Furnaces in Blast.

Location of Furnaces.	Total number of stacks.	Apr. 1 Number in blast.	Apr. 1 Capacity per day.	Mar. 1 Number in blast.	Mar. 1 Capacity per day.
New York:					
Buffalo	17	12	4,173	11	3,561
Other New York	7	3	607	3	618
New Jersey	7	0	0	0	0
Pennsylvania:					
Lehigh Valley	22	10	2,480	10	2,475
Spiegel	3	1	96	1	100
Schuylkill Valley	16	8	2,058	8	2,090
Lower Susquehanna	7	2	619	2	608
Lebanon Valley	10	6	804	5	811
Pittsburgh District	49	47	20,152	44	18,278
Spiegel	4	2	225	3	335
Shenango Valley	20	11	3,814	12	4,047
Western Pennsylvania	27	15	4,010	14	3,736
Maryland	4	2	577	2	549
Wheeling District	14	11	4,003	11	4,055
Ohio:					
Mahoning Valley	24	20	8,222	20	7,855
Central and Northern	23	16	6,137	16	5,805
Hocking Val., Hanging Rock & S. W. Ohio	15	9	1,284	8	1,195
Illinois	31	26	10,100	23	8,827
Spiegel	2	0	0	1	120
Mich., Wis. and Minn.	10	5	1,182	5	1,127
Colorado, Mo. and Wash.	8	3	1,085	3	1,017
The South:					
Virginia	23	3	405	5	780
Kentucky	5	1	125	1	135
Alabama	46	18	4,875	18	4,650
Tennessee	20	7	854	7	822
Total	414	238	77,887	233	73,641

Among furnaces blown in in March were one Lackawanna at Buffalo, Sheridan in the Lebanon Valley (April 1), Soho and one Aliquippa in Allegheny County, Perry in Western Pennsylvania, Alleghany in Virginia, Upson in Ohio, Belfont in the Hanging Rock district, one South Chicago in the Chicago district, one Bessemer in Alabama and Rockdale in Tennessee.

The list of furnaces blown out last month includes No. 3 South Sharon in the Shenango Valley, Buena Vista, Pulaski and Radford Crane in Virginia, one Carnegie at Columbus, Ohio, Woodstock in Alabama, and Johnson City in Tennessee.

Chart of Pig Iron Production and Prices

The fluctuations in pig iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy line are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The figures for daily average production are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons.

	1907.	1908.	1909.	1910.	1911.	1912.
January	71,149	33,918	57,975	84,148	56,752	66,384
February	73,038	37,163	60,976	85,616	64,090	72,442
March	71,821	39,619	59,232	84,459	70,036	77,591
April	73,885	38,289	57,962	82,792	68,836	.....
May	74,048	37,603	60,753	77,102	61,079	.....
June	74,486	36,444	64,656	75,516	59,585	.....
July	72,763	39,287	67,793	69,305	57,841	.....
August	72,594	43,851	72,546	67,963	62,150	.....
September	72,783	47,300	79,507	68,476	65,903	.....
October	75,386	50,554	83,856	67,520	67,811	.....
November	60,937	51,595	84,917	63,659	66,648	.....
December	39,815	56,158	85,022	57,349	65,912	.....

The Record of Production

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons.

	1907.	1908.	1909.	1910.	1911.	1912.
Jan.	2,205,607	1,045,250	1,797,560	2,608,605	1,759,326	2,057,911
Feb.	2,045,068	1,077,740	1,707,340	2,397,254	1,794,509	2,100,815
Mar.	2,226,457	1,228,204	1,832,194	2,617,949	2,171,111	2,405,318
Apr.	2,216,558	1,149,602	1,738,877	2,483,763	2,064,086	.....
May	2,295,505	1,165,688	1,883,330	2,390,180	1,893,456	.....
June	2,234,575	1,092,131	1,930,866	2,265,478	1,787,566	.....
July	2,255,660	1,218,129	2,103,431	2,148,442	1,793,068	.....
Aug.	2,250,410	1,359,831	2,248,930	2,106,847	1,926,637	.....
Sept.	2,183,487	1,418,998	2,385,206	2,056,275	1,977,102	.....
Oct.	2,336,972	1,567,198	2,599,541	2,093,121	2,102,147	.....
Nov.	1,828,125	1,577,854	2,547,508	1,909,780	1,999,433	.....
Dec.	1,234,279	1,740,912	2,635,680	1,777,817	2,043,270	.....

The H. Koppers Company has succeeded to the business of H. Koppers, Joliet, Ill., and will soon have general offices in the Mallers Building, southeast corner of Madison street and Wabash avenue, Chicago, Ill. The date of removal will be duly announced. Louis Wilputte, formerly connected with the business of H. Koppers, is not connected with the H. Koppers Company.

Our Blast-Furnace Record for 1911

The American Iron and Steel Association publishes in its Bulletin the following blast-furnace information:

In 1911 there were eight entirely new blast furnaces built in the United States, all coke, with an annual capacity of 1,152,500 gross tons. Three of the furnaces, with an annual capacity of 437,500 tons, had not been blown in down to January 1, 1912. On December 31, 1911, there were one charcoal and twelve coke blast furnaces in course of erection, with a total annual capacity of 1,744,500 tons, of which 20,000 tons were charcoal and 1,724,500 tons were coke. One or two of the coke furnaces have been completed and blown in since the opening of the present year; others are to be completed later in the year, while still others may not be ready for blast until after the opening of 1913.

In 1911 twenty blast furnaces were abandoned or dismantled in the United States, with a total annual capacity of 404,700 gross tons. Of the total, seven furnaces, with an annual capacity of 60,700 tons, used charcoal for fuel when last in blast, and thirteen furnaces, with an annual capacity of 344,000 tons, used mineral fuel.

Canadian Blast Furnaces

The American Iron and Steel Association publishes in its Bulletin the following Canadian blast-furnace information:

On December 31, 1911, Canada had eighteen completed furnaces, of which twelve were in blast and six were idle. Of the furnaces in blast one was charcoal. Of the grand total fourteen usually use coke for fuel and four use charcoal. In addition two coke furnaces were being built on December 31.

In 1911 the Canadian furnaces consumed 1,565,877 gross tons of iron ore, etc., and 41,427 tons of mill cinder, scale, turnings, etc., in the manufacture of pig iron, ferrosilicon, etc. They also consumed 567,462 tons of limestone for fluxing purposes. The average consumption of iron ore, mill cinder, scale, etc., in 1911 per ton of pig iron made was 1.94 tons.

The Dominion Iron & Steel Company, Ltd., is adding two blast furnaces to its works at Sydney, Nova Scotia, to be known as Nos. 7 and 8. Each stack is to be 85 by 20 ft., and will have an annual capacity of about 80,000 tons of basic pig iron. The construction of No. 8 furnace was commenced in 1910 and No. 7 on March 9, 1911. No. 8 will probably be ready for blast in April and No. 7 in December, 1912. Each furnace will be equipped with four hot-blast stoves, each 85 by 21 ft. The company has four completed blast furnaces at Sydney, all of which were in operation on December 31, 1911.

The Steel Company of Canada is about to add two 60-gross-ton open-hearth furnaces to its steel plant at Hamilton. It will also add a blooming mill, a billet mill and a rod mill.

Emanuel Dreifus & Co.'s Affairs Involved

Emanuel Dreifus & Co., iron and steel merchants, Arcade Building, Philadelphia, Pa., have asked for an extension of time from their creditors, to meet their obligations. It is stated that their liabilities aggregate $590,000, while assets are placed at $750,000. A meeting of the creditors was held a few days ago, when a committee consisting of W. Vernon Phillips, Perry-Buxton-Doane Company; G. Herbert Leaf, E. P. Leaf Company, and F. B. Snyder, First National Bank of Philadelphia, was appointed. This committee will examine the accounts of the firm and report to a further meeting of the creditors to be held April 4. A large share of the assets consists of ownership interests in the Schuylkill Haven Iron & Steel Company and the Hudson Structural Steel Company.

Correction.—On page 798 of *The Iron Age*, March 14, 1912, in the New Tools and Appliances Department, an item appeared regarding a new ratchet tap wrench. By an unfortunate typographical error the maker of this wrench was given as the Albert Tool Company, 4731 North Mascher street, Philadelphia, Pa. It should have been the Alert Tool Company, which has recently moved to 221 North Twenty-third street, the same city.

The Iron and Metal Markets

Pig Iron Advancing

Good Buying by Foundries and Steel Works

Production Now 28,700,000 Tons a Year—A Stronger Market in Finished Lines

The pig iron market has been increasingly active, with prices advancing in all districts. There are signs also that the demand for finished material, which has been held back in some lines since manufacturers took a stand for higher prices, will develop into a broader movement as the season advances.

Pig iron output increased remarkably in March. Our statistics show a total of 2,405,318 tons, against 2,100,815 tons in February. The daily average was thus 77,591 tons, against 72,442 tons in the previous month, a gain of 5150 tons a day. Such a forward bound has not been known in many months. The steel companies contributed all of the gain and more, increasing their output by 5480 tons a day over February, while the merchant furnaces fell back 330 tons a day. It is a tradition of the industry to strain for records in March and this effort was particularly noticeable at Steel Corporation furnaces, their output in March being about 1,220,000 tons.

The 238 blast furnaces active April 1 were producing at the rate of 77,887 tons a day, based on their heavy March output, as against 73,641 tons a day for 233 furnaces on March 1. This means that pig iron production (estimating charcoal iron) is now at the rate of 28,700,000 tons a year, which is 1,600,000 tons more than the rate of March 1 and 1,400,000 tons more than the record output of 27,300,000 tons in 1910.

The pig iron situation, which was confused one week ago by the uncertainty as to a coal strike and by speculation as to the effect of the reduction in Lake ore prices, has clarified rather rapidly, as avoidance of a bituminous strike has been practically assured. Demand has developed for all kinds of iron. The largest transaction was for 60,000 tons of Southern pipe iron, taken by one interest, and 25,000 tons additional is under negotiation by the same buyer. Southern iron has advanced to a minimum of $10.50 for No. 2, while third quarter iron has sold at $10.75, and $11 is asked for that delivery by two large sellers. No. 3 and No. 4 Southern iron can scarcely be had for prompt shipment.

Northern furnaces have advanced their prices 25 cents for foundry grades in the past week, and some are holding for 25 cents higher. Activity is more pronounced in the East than in the Middle West. Buffalo furnaces have made considerable sales. In some cases Canadian foundries are coming to them for prompt iron, their supply of British iron having been cut off by the coal strike.

A sale of 40,000 tons of Bessemer iron to the Republic Iron & Steel Company at $14.25 Mahoning Valley furnace is reported this week, deliveries covering April and May. A number of Eastern Pennsylvania buyers of basic have been in the market, inquiries pending representing nearly 50,000 tons. Sellers are asking $14.75 and $15, delivered, and buyers' offers of $14.50 have been refused. Several sales of Alabama basic iron have been made in the west and southwest.

Further heavy car buying is looked for. The Harriman lines are reported to be in the market for 15,000 cars, while the inquiries of the Denver & Rio Grande, the Atlantic Coast Line and the Seaboard Air Line amount to 5500. A Canadian car company is inquiring in this country for steel for 8000 cars recently placed by Canadian roads. Rail orders of the past week include 27,000 tons for the St. Paul, 11,000 tons each for the Omaha and the Chicago & Northwestern, 26,400 tons for the Rock Island, 12,000 tons for the International & Great Northern and 40,000 tons for a Western road.

Plates and structural shapes are more firmly held at 1.20c. Pittsburgh and bars at 1.15c., the expectation of an increasing business in these lines in the next three months having stiffened leading sellers. From the Chicago district, plate business has overflowed to mills farther east, and two Eastern plate mills that have been running at 50 to 60 per cent. of capacity are now operating nearly full. Sheets are firmer, and a further advance by the leading producer is looked for in both black and galvanized.

The advance in wages made April 1 by the Frick Coke Company to the highest level ever known in the Connellsville district is significant of the absence of surplus labor in that field and is in line with the efforts of bituminous coal operators to prevent a strike by conceding some increase.

The statement of the Steel Corporation's unfilled orders as of March 31 is expected to show some falling off. The noteworthy feature of the situation, and one that marks a change in the past two weeks, is that steel manufacturers now believe, as some of them have not heretofore, that prices will advance and that any business that has been checked by higher quotations has not been postponed for long.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type. Declines in Italics.

At date, one week, one month and one year previous.

	Apr. 3, 1912.	Mar. 27, 1912.	Mar. 6, 1912.	Apr. 5, 1911.
Pig Iron, Per Gross Ton:				
Foundry No. 2 standard, Philadelphia	$15.00	$15.00	$14.85	$15.50
Foundry No. 2, Valley furnace	13.25	13.25	13.00	13.75
Foundry No. 2, Southern, Cincinnati	**13.75**	13.50	13.50	14.25
Foundry No. 2, Birmingham, Ala.	**10.50**	10.25	10.25	11.00
Foundry No. 2, at furnace, Chicago*	**14.25**	14.00	14.00	15.50
Basic, delivered, eastern Pa.	14.50	14.50	14.25	15.25
Basic, Valley furnace	13.00	13.00	12.40	13.75
Bessemer, Pittsburgh	15.15	15.15	14.90	15.90
Malleable Bessemer, Chicago	14.00	14.00	14.00	15.50
Gray forge, Pittsburgh	13.65	13.65	13.40	14.40
Lake Superior charcoal, Chicago	15.75	15.75	15.75	17.50
Billets, etc., Per Gross Ton:				
Bessemer billets, Pittsburgh	20.00	20.00	20.00	23.00
Open-hearth billets, Pittsburgh	20.00	20.00	19.50	23.00
Forging billets, Pittsburgh	26.50	26.50	26.50	28.00
Open hearth billets, Philadelphia	22.40	22.40	22.40	25.40
Wire rods, Pittsburgh	25.00	25.00	25.00	29.00
Old Material, Per Gross Ton:				
Iron rails, Chicago	15.25	15.25	15.00	14.50
Iron rails, Philadelphia	15.50	15.50	15.50	18.00
Car wheels, Chicago	13.00	13.00	13.00	13.25
Car wheels, Philadelphia	12.50	12.50	11.75	13.25
Heavy steel scrap, Pittsburgh	13.00	13.00	12.00	13.75
Heavy steel scrap, Chicago	**11.00**	10.75	10.50	11.50
Heavy steel scrap, Philadelphia	**12.50**	12.00	11.50	13.50

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Finished Iron and Steel	Apr. 3, 1912.	Mar. 27, 1912.	Mar. 6, 1912.	Apr. 5, 1911.
Per Pound to Largest Buyers:	Cents.	Cents.	Cents.	Cents.
Bessemer rails, heavy, at mill...	1.25	1.25	1.25	1.25
Iron bars, Philadelphia.....	**1.25**	1.22½	1.25	1.37½
Iron bars, Pittsburgh.....	1.25	1.25	1.25	1.35
Iron bars, Chicago.....	1.15	1.15	1.15	1.25
Steel bars, Pittsburgh.....	**1.15**	1.10	1.10	1.40
Steel bars, tidewater, New York	**1.31**	1.26	1.26	1.56
Tank plates, Pittsburgh.....	**1.20**	1.15	1.10	1.40
Tank plates, tidewater, New York	1.31	1.31	1.26	1.56
Beams, Pittsburgh	**1.20**	1.15	1.15	1.40
Beams, tidewater, New York....	1.31	1.31	1.31	1.56
Angles, Pittsburgh	**1.20**	1.15	1.15	1.40
Angles, tidewater, New York..	1.31	1.31	1.31	1.56
Skelp, grooved steel, Pittsburgh	1.10	1.10	1.10	1.30
Skelp, sheared steel, Pittsburgh	1.15	1.15	1.15	1.35
Sheets, Nails and Wire,				
Per Pound to Largest Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, Pittsburgh	**1.85**	1.80	1.80	2.20
Wire nails, Pittsburgh.....	1.60	1.60	1.60	1.80
Cut nails, Pittsburgh.....	1.55	1.55	1.55	1.70
Fence wire, ann'led, 0 to 9, P'gh.	1.40	1.40	1.40	1.60
Barb wire, galv., Pittsburgh....	1.90	1.90	1.90	2.10
Coke, Connellsville,				
Per Net Ton, at Oven:				
Furnace coke, prompt shipment.	*2.10*	2.25	1.85	1.60
Furnace coke, future delivery..	*2.15*	2.25	1.85	1.75
Foundry coke, prompt shipment.	*2.50*	2.75	2.25	2.00
Foundry coke, future delivery..	2.50	2.50	2.25	2 25
Metals, Per Pound:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York.....	**16.00**	15.50	14.62½	12.50
Electrolytic copper, New York..	**16.00**	15.37½	14.50	12.25
Spelter, St. Louis.....	6.60	6.60	6.82½	5.35
Spelter, New York.....	6.75	6.75	6.97½	5.55
Lead, St. Louis.....	4.12½	4.12½	3.92½	4.30
Lead, New York.....	4.20	4.20	4.00	4.40
Tin, New York.....	*43.00*	43.37½	43.25	41.75
Antimony, Hallett, New York..	7.75	7.75	7.37½	9.12½
Tin plate, 100 lb. box, New York	$3.54	$3.54	$3.54	$3.94

Prices of Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb., New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Paul, 32c.; St. Louis, 22½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.20c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per square foot, are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per square foot, take base price. Plates over 72 in. wide ordered less than 11 lb. per square foot down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.	Cents per lb.
Gauges under ¼ in. to and including 3-16 in. on thinnest edge	.10
Gauges under 3-16 in. to and including No. 8	.15
Gauges under No. 8 to and including No. 9	.25
Gauges under No. 9 to and including No. 10	.30
Gauges under No. 10 to and including No. 12	.40
Sketches (including all straight taper plates) 3 ft. and over in length	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft., inclusive	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inclusive	.50
Cutting to lengths or diameters under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Wire Rods and Wire.—Bessemer, open hearth and chain rods, $25. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days, or 2 per cent. discount in 10 days, carload lots, to jobbers, annealed, $1.40; galvanized, $1.70. Carload lots to retailers, annealed, $1.50; galvanized, $1.80. Galvanized barb wire, to jobbers, $1.90; painted, $1.60. Wire nails, to jobbers, $1.60.

The following table gives the prices to retail merchants on wire in less than carloads, including the extras on Nos. 10 to 16, which are added to the base price:

Fence Wire, Per 100 Lb.

Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	$1.55	$1.60	$1.65	$1.70	$1.80	$1.90	$2.00	$2.10
Galvanized	1.85	1.90	1.95	2.00	2.10	2.20	2.60	2.70

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in., and angles, 3 to 6 in., on one or both legs, ¼ in. and over, 1.20c. Other shapes and sizes are quoted as follows:

	Cents per lb.
I-beams over 15 in	1.25 to 1.30
H-beams over 18 in	1.25 to 1.30
Angles over 6 in	1.25 to 1.30
Angles, 3 in. on one or both legs, less than ¼ in. thick, plus full extras, as per steel bar card Sept. 1, 1909	1.25 to 1.30
Tees, 3 in. and up	1.25 to 1.30
Zees, 3 in. and up	1.20 to 1.25
Angles, channels and tees, under 3 in., plus full extras as per steel bar card Sept. 1, 1909	1.25 to 1.30
Deck beams and bulb angles	1.50 to 1.55
Hand rail tees	2.05 to 2.20
Checkered and corrugated plates	2.05 to 2.20

Sheets.—Makers' prices for mill shipments on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advances for small lots from store, are as follows:

Blue Annealed Sheets.

	Cents per lb.
Nos. 3 to 8	1.20 to 1.25
Nos. 9 and 10	1.30 to 1.35
Nos. 11 and 12	1.35 to 1.40
Nos. 13 and 14	1.40 to 1.45
Nos. 15 and 16	1.50 to 1.55

Box Annealed Sheets, Cold Rolled.

	One Pass.	Three Pass.
Nos. 10 to 12	1.50 to 1.55	.....
Nos. 13 and 14	1.55 to 1.60	.....
Nos. 15 and 16	1.60 to 1.65	1.70 to 1.75
Nos. 17 to 21	1.65 to 1.70	1.75 to 1.80
Nos. 22, 23 and 24	1.70 to 1.75	1.80 to 1.85
Nos. 25 and 26	1.75 to 1.80	1.85 to 1.90
No. 27	1.80 to 1.85	1.90 to 1.95
No. 28	1.85 to 1.90	1.95 to 2.00
No. 29	1.90 to 1.95	2.00 to 2.05
No. 30	2.00 to 2.05	2.10 to 2.15

Galvanized Sheets of Black Sheet Gauge.

Nos. 10 and 11	1.85 to 1.90
Nos. 12, 13 and 14	1.95 to 2.00
Nos. 15, 16 and 17	2.10 to 2.15
Nos. 18 to 22	2.25 to 2.30
Nos. 23 and 24	2.35 to 2.40
Nos. 25 and 26	2.55 to 2.60
No. 27	2.70 to 2.75
No. 28	2.85 to 2.90
No. 29	2.95 to 3.00
No. 30	3.15 to 3.20

All above rates on sheets are f.o.b. Pittsburgh, terms 30 days net, or 2 per cent. cash discount in 10 days from date of invoice, as also are the following base prices per square for painted and galvanized roofing sheets, with 2½-in. corrugations.

Corrugated Roofing Sheets Per Square.

Gauge.	Painted.	Galvanized.	Gauge.	Painted.	Galvanized.
29	....	$2.20	23	$2.25	$3.35
28	$1.30	2.45	22	2.40	3.50
27	1.40	2.50	21	2.60	3.85
26	1.50	2.55	20	2.85	4.15
25	1.70	2.90	18	3.80	5.40
24	1.95	3.00	16	4.55	6.25

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on wrought pipe, in effect from December 1, 1911; galvanized iron pipe, from March 1, 1912:

Butt Weld.

	Steel		Iron	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ in.	74	54	68	49
⅜ in.	75	65	69	53
½ in.	78	68	72	59
¾ to 1½ in.	81	72	75	64
2 to 3 in.	82	75	76	65
Lap Weld.				
1¼ and 1½ in.	..	..	68	61
2 in.	79	72	72	63
2½ to 4 in.	81	74	74	66
4½ to 6 in.	80	72	73	65
7 to 12 in.	78	68	71	61
13 to 15 in.	55	..	47	..
Butt Weld, extra strong, plain ends, card weight.				
⅛, ¼, ⅜ in.	70	60	65	55
½ in.	75	69	70	63
¾ to 1½ in.	79	73	74	65
2 to 3 in.	80	74	75	66
Lap Weld, extra strong, plain ends, card weight.				
1½ in.	..	..	66	60
2 in.	76	70	71	63
2½ to 4 in.	78	72	73	66
4½ to 6 in.	77	71	72	65
7 to 8 in.	70	60	65	55
9 to 12 in.	65	55	60	50

Butt Weld, double extra strong, plain ends, card weight.				
⅛ in.	65	59	60	52
¼ to 1½ in.	68	62	63	55
2 to 3 in.	70	64	65	57
Lap Weld, double extra strong, plain ends, card weight.				
2 in.	66	60	61	52
2¼ to 4 in.	68	62	63	57
4½ to 6 in.	67	61	62	56
7 to 8 in.	60	50	55	45

Plugged and Reamed.

1 to 1½, 2 to 3 in. Butt Weld
2, 2½ to 4 in. Lap Weld

} Will be sold at two (2) points lower basing (higher price) than merchants' or card weight pipe. Butt or lap weld as specified.

The above discounts are for "card weight," subject to the usual variation of 5 per cent. Prices for less than carloads are three (3) points lower basing (higher price) than the above discounts.

Boiler Tubes.—Discounts on lap welded steel and standard charcoal iron boiler tubes to jobbers in carloads are as follows:

Steel.		*Standard Charcoal Iron.*	
1¼ to 2¼ in.	65	1½ in.	48
2½ in.	67½	1¾ to 2¼ in.	50
2¾ to 3¼ in.	72½	2½ in.	55
3½ to 4 in.	75	2¾ to 5 in.	60
5 to 6 in.	67½	Locomotive and steamship special grades bring higher prices.	
7 to 13 in.	65		

2½ in. and smaller, over 18 ft., 10 per cent. net extra.
2¾ in. and larger, over 22 ft., 10 per cent. net extra.
Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi River must be sold f. o. b. mill at Pittsburgh basing discount, lowered by two points.

Pittsburgh

PITTSBURGH, PA., April 3, 1912.

An informal meeting of a number of steel manufacturers is reported to have been held Tuesday in this city, but nothing official has been given out as to matters under discussion. The agreement reached at Cleveland last week between the soft coal operators and miners' representatives, which will likely be ratified by a vote of the miners, removes one uncertain element, but the break in ore prices has offset it, both makers and consumers of pig iron being at sea. For the moment prices on pig iron seem to be a trifle weaker, consumers being disposed to postpone buying. On the other hand, we have a period of unusual activity among steel works, rolling mills and foundries, and the consumption of pig iron is therefore heavier than at any time in several years. Consumers of billets and sheet bars are specifying heavily, and shipments of steel by the mills in March were greater than in any one month in a long time. The advance in plates and shapes to 1.20c. and in steel bars to 1.15c. has not been thoroughly tested, little new business having been placed at these prices. The whole market on hot-rolled products is firm with the exception of shafting and railroad spikes, prices on which continue low. The scrap iron market is strong, with consumers willing to take in material at to-day's prices but dealers not anxious to sell. As a natural reflection of the settlement of the threatened bituminous miners' strike, Connellsville coke has quieted down.

Pig Iron.—The average price of Bessemer iron in March, based on sales of 1000 tons or more, is given out by W. P. Snyder & Co. to have been $14.0356, and on basic $12.76, both at Valley furnace. The local pig iron market is quiet. In view of the unsettled prices on ore for this year's delivery, consumers are deferring contracts for second quarter delivery and are strongly inclined to buy iron only as needed until the situation has cleared up. The only sale of note reported is of 1500 tons of basic iron for second half delivery at $13.25, Valley furnace, to an open-hearth steel plant, but it has not been officially confirmed. Should ore settle down to a low figure, which it promises to do, lower values on pig iron are not unlikely. We quote: Bessemer iron, $14.25; basic, $13; malleable Bessemer, $13 to $13.25; gray forge, $12.75, and No. 2 foundry, $13.25, all at Valley furnace, the freight rate for delivery in the Pittsburgh district being 90c. a ton.

Steel Billets.—The rail and billet sales department of the Carnegie Steel Company reports that its orders sent to the mills for rolling in March showed a decided increase over February and the volume promises to be equally as large this month. The Jones & Laughlin Steel Company will start a fourth Talbot open-hearth furnace at Aliquippa this week, and when all four are running properly they will turn out about 1000 tons per day. However, the finishing mills at Aliquippa use up more than 1000 tons, so that the company cannot be figured as an active seller of steel in the open market. Nearly all consumers of billets and sheet bars are covered by contracts, but there is a steady demand for small lots, figuring up a fairly large tonnage, and for which higher prices are being paid than ruled a month ago. We quote: F.o.b. Pittsburgh, Bessemer and open-hearth billets, $20; Bessemer and open-hearth sheet bars, $21; forging billets, $28; f.o.b. Youngstown, Bessemer and open-hearth billets, $19.50 to $20; Bessemer and open-hearth sheet bars, $20.50 to $21.

Ferromanganese.—A few dealers are still asking premiums for prompt shipment, but consumers are pretty well covered and inquiry is light. Sales of about 50 to 75 tons are reported at about 50c. a ton over regular prices. Deliveries are slightly better. We quote English 80 per cent. for forward delivery at $41, f.o.b. Baltimore, with a freight rate of $1.95 a ton for delivery in Pittsburgh district.

Ferrosilicon.—The demand is only for small lots for prompt shipment. It is said that regular prices are being maintained. We quote 50 per cent. in lots up to 100 tons at $70; over 100 tons to 600 tons, $69, and over 600 tons, $68, Pittsburgh. The lower grades are ruling at about $20 for 10 per cent.; $21 for 11 per cent.; $22 for 12 per cent., f.o.b. cars at furnace, Ashland, Ky., or Jackson, Ohio.

Wire Rods.—The improvement in the demand for wire products is reflected in rods, for which inquiry is better and prices are firmer. A sale of 500 tons of Bessemer rods to a wire nail mill for April and May delivery was made at $25, Pittsburgh.

Skelp.—March shipments to the pipe mills are reported to have been heavier than in any one month for a long time. Inquiry is better and prices are firmer, though not actually higher. We quote grooved steel skelp at 1.10c. to 1.12½c.; sheared steel skelp, 1.15c. to 1.20c.; grooved iron skelp, 1.40c. to 1.45c., and sheared iron skelp, 1.55c. to 1.60c., all for delivery at buyers' mill in the Pittsburgh district.

Muck Bar.—A consumer is reported as being in the market for 500 tons a month over April, May and June. In sympathy with other lines of semi-finished products, prices on muck bar are stronger, and we quote best grades made from all pig iron at $28.50, delivered at buyer's mill in the Pittsburgh district.

Steel Rails.—The Ohio works of the Carnegie Steel Company at Youngstown, Ohio, is scheduled to go on rails on Sunday night, April 7, to roll a large order of open-hearth rails for a domestic road. Of the order for rails placed by the Rock Island, 500 tons was taken by the Cambria Steel Company. The higher prices on light rails have restricted the demand to some extent. The Carnegie Steel Company received new orders and specifications the past week for about 2200 tons of light rails, and also received good specifications against contracts for standard sections. We quote splice bars at 1.50c. per lb. and rails as follows: Standard sections, 1.25c. per lb.; 8 and 10-lb. light rails, 1.29½c.; 12 and 14-lb., 1.20c.; 16 and 20-lb., 1.15c.; 25, 30, 35, 40 and 45-lb., 1.10c., in carload lots, f.o.b. Pittsburgh.

Structural Material.—The largest local job in the market is the steel, 7000 tons, for the new open-hearth building of the Brier Hill Steel Company, Youngstown, Ohio. The steel for the new Monongahela Hotel, 1000 to 1200 tons, will soon be asked for, and close to 1000 tons for the new building of the East End Savings & Trust Company in this city. The McClintic-Marshall Construction Company has taken a pier shed for the city of Mobile, Ala., about 660 tons. The American Bridge Company has taken 500 tons for a store building for the McCurdy-Norwell Company, Rochester, N. Y., and two buildings for Cornell University, Ithaca, N. Y., about 450 tons. The two local makers of structural steel state they are adhering rigidly to 1.20c. on shapes, and notices have been sent to all structural fabricators not to bid on new work based on less than this price. The trouble is, however, that nearly all structural concerns still have a good deal of steel due them on old contracts at 1.10c. or lower and are likely to base bids on these prices. For this reason there has not as yet been much improvement in prices submitted on new fabricated work. We quote beams and channels up to 15 in. on the basis of 1.20c., Pittsburgh.

Plates.—Car orders have been scarce, but the Harriman Lines are reported as about ready to buy 8000 composite type cars, and inquiries are expected to reach the steel car companies within a few days. The Atlantic Coast Line wants 2000 cars and the Seaboard Air Line 1500 cars. Other roads are reported to contemplate the purchase of cars, but definite inquiries have not come out. Prices on plates are firmer, the Car-

negie and Jones & Laughlin steel companies being reported as holding at 1.20c. and declining to shade that figure. We quote ¼-in. and heavier plates at 1.20c., f.o.b. Pittsburgh.

Sheets.—The volume of new business is heavy and specifications are pouring into the mills, but so far the improvement in prices has been slight. The American Sheet & Tin Plate Company has put its minimum price on No. 28 black sheets at 1.85c., refusing absolutely to shade that figure, and has taken contracts at 1.90c. Its minimum price on galvanized sheets is reported at 2.90c., but some of the other sheet mills are still naming 2.85c. at mill. Shipments by the mills in March were heavier than in any one month for a very long time and several report heavier than in any month in their history. The American Sheet & Tin Plate Company is operating to 87 per cent. of its hot sheet mill capacity and expects to slightly increase this in the near future by the starting up of another works now idle. The market seems to be on the basis of 1.85c. to 1.90c. for No. 28 black and 2.85c. to 2.90c. for No. 28 galvanized, the lower prices being absolutely minimum regardless of the size of the order or the specifications.

Tin Plate.—In March the American Sheet & Tin Plate Company broke all previous records for any one month not only in specifications received, but in actual shipments, and several other leading tin plate mills make similar reports. There is practically no new demand, as consumers are well covered. The American Sheet & Tin Plate Company is operating to about 95 per cent. of capacity of its hot tin mills, with the exception of Gary, where it is suffering from a shortage of steel, its supply being drawn from the Illinois Steel Company; otherwise, more mills at Gary would be on. Leading independent tin plate mills are operating to full capacity and have enough business booked to keep up this rate of operations. Prices are firmer. On the small inquiry that is coming out from $3.30 to $3.40 per base box for 14 x 20 coke plates is being quoted.

Iron and Steel Bars.—Mills report that the demand for steel bars is picking up and there has been an improvement in specifications. All the leading steel bar mills are now quoting on the basis of 1.15c. f.o.b., Pittsburgh, but only a comparatively small amount of new business has been placed at this price as nearly all consumers still have a good deal of tonnage due them on contracts placed sometime ago on the 1.05c. and 1.10c. basis. On small contracts for steel bars, which expired March 31, the unspecified portions were canceled. The new demand for iron bars is only fair and specifications against contracts are not very satisfactory. We now quote steel bars at 1.15c., which is referred to as being minimum of the market, and common iron bars at 1.25c. at maker's mill.

Hoops and Bands.—In sympathy with the higher prices on steel bars, most makers of bands are now quoting 1.15c. and state that they are refusing to shade this price. The new demand for both hoops and bands is better and specifications against contracts were heavier in March than in any one month for a long time. We now quote steel bands at 1.15c., with extras as per the steel bar card, and hoops at 1.25c. to 1.30c. f.o.b., Pittsburgh.

Rivets.—The new demand for rivets and specifications against contracts were heavier in March than for a long time and shipments by makers to customers were also larger. The rivet market is referred to as being decidedly better. We quote structural rivets at 1.45c. to 1.50c. and boiler rivets at 1.55c. to 1.60c. f.o.b., Pittsburgh.

Shafting.—This is one of the few items in the list of finished material not as yet showing any improvement in price. The new demand is reported by makers to be better, and specifications are also coming in more freely from all classes of consumers, but prices remain very low. We quote cold-rolled shafting at 67 per cent. off in carloads and 62 per cent. in less than carloads, delivered in base territory.

Merchant Steel.—The new demand in March and shipments by the mills are reported by several leading makers to have been the heaviest in any one month for several years. One leading mill states that its shipments last month were 30 per cent. heavier than in February. Prices are stronger but are not as yet any higher. We quote: Iron finished tire, 1½ x ⅜-in. and larger, 1.15c., base; planished tire, ⅛-in. and larger, 1.35c.; channel tire, ¾, ⅞ and 1-in., 1.65c.; toe calk, 1.70c., base; flat sleigh shoe, 1.25c.; concave or convex, 1.55c.; cutter shoe tapered or bent, 2.15c.; spring steel, 1.75c.; machinery steel, smooth finish, 1.50c., all f.o.b. at mill.

Spelter.—The market has been quiet with prices ruling fairly steady. We quote prime grades of Western at about 6.57½c., Pittsburgh, but for any considerable tonnage this price would probably be shaded.

Railroad Spikes.—Liberal specifications are coming in on contracts, and the new demand is fairly good, but so far prices have shown no betterment. We quote railroad spikes in base sizes at $1.35 per 100 lb. f.o.b., Pittsburgh.

Wire Products.—Conditions in this trade are reported as slightly more favorable, the new demand being a little better and specifications coming in a little more freely. The continued wet weather has greatly restricted outdoor operations, and it seems as if spring trade this year may fall short of expectations. The new demand and specifications for wire nails in March were heavier than in the previous month. The tone of prices is firmer. We quote wire nails at $1.60; cut nails, $1.50; galvanized barb wire, $1.90; painted, $1.60; annealed fence wire, $1.40, and galvanized fence wire, $1.70, f.o.b. Pittsburgh, usual terms, freight added to point of delivery.

Merchant Pipe.—No large gas or oil lines were placed in the past week, but several projects are under way that will require a very heavy tonnage of large pipe and which are expected to develop in the near future. Some low prices continue to be made on inquiries for line pipe that are coming up. Orders for merchant pipe sent to the mills for rolling in March were from 20 to 30 per cent. heavier than in February and are expected to be equally as good this month. It is stated that regular discounts on iron and steel pipe are being pretty generally observed.

Boiler Tubes.—Liberal specifications against contracts for locomotive tubes placed several months ago are being received and shipments by the mills in March were heavier than in any one month for some time. The new demand for merchant tubes is reported to be slightly better, but relatively low prices continue to rule.

Iron and Steel Scrap.—Bids of local dealers on the Pennsylvania Railroad Eastern Lines list went in last week and on nearly all grades slightly higher prices were named than on the previous list. The consumption of scrap by steel companies in this and nearby districts is larger than for a long time, and dealers believe that some of them will soon have to buy heavily. Certain consumers are willing to contract ahead for heavy steel scrap on the basis of $13 delivered, but dealers are not anxious to sell at this price as the available supply is not large. Sales of about 2500 tons of heavy steel scrap are reported at $13, delivered at Youngstown and Sharon. A sale of 500 tons of low phosphorus melting stock was made at $15.25, delivered. Dealers are now quoting as follows, per gross ton, f.o.b. Pittsburgh, unless otherwise noted:

Heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen and Pittsburgh delivery	$13.00
No. 1 foundry cast	$12.75 to 13.00
No. 2 foundry cast	10.75 to 11.00
Bundled sheet scrap, f.o.b. consumers' mill, Pittsburgh district	11.25 to 11.50
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	13.25 to 13.50
No. 1 railroad malleable stock	11.75 to 12.00
Grate bars	9.50 to 9.75
Low phosphorus melting stock	15.00 to 15.25
Iron car axles	21.00 to 21.50
Steel car axles	15.50 to 15.75
Locomotive axle	22.00 to 22.50
No. 1 busheling scrap	11.50 to 11.75
No. 2 busheling scrap	8.00 to 8.25
Old car wheels	13.00 to 13.25
*Cast iron borings	9.75 to 10.00
*Machine shop turnings	10.00 to 10.25
†Sheet bar crop ends	14.00 to 14.25
Old iron rails	14.50 to 14.75
No. 1 wrought scrap	13.00 to 13.25
Heavy steel axle turnings	10.25 to 10.50
Stove plate	9.50 to 9.75

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.

†Shipping point.

Connellsville Coke.—The new demand for spot furnace and foundry coke is not so urgent. This is no doubt largely due to the settlement of the soft coal miners' strike. The heavy rains in the coke regions last week caused a falling off in the output of nearly 9000 tons. We quote prompt furnace coke at $2.10 to $2.15, and prompt foundry coke at $2.50 to $2.75 per net ton at oven. There is some inquiry in the market for furnace and foundry coke for the last half of the year, but under present conditions coke makers hardly know what prices to quote and no business has been closed.

Chicago

CHICAGO, ILL., April 2, 1912.

Indications point to a steady improvement in market and mill conditions. While the higher quotations now named by producers generally are not being maintained in every instance, concessions are increasingly scarce, and the more important producers are more willing daily to pass by such business as cannot be secured at full prices. This is not surprising in view of the fact that on steel bars regular deliveries can scarcely be made before July, and on plates and structural shapes from 8 to 10 weeks is required. Specifications for all of the heavier lines of finished steel were unusually heavy the past month, and for practically all of the mills in this district March showed the heaviest production of the year. The three leading railroads each increased their rail tonnage under contract; the Wabash and Northern Pacific were buyers of additional cars, and the Santa Fé has an inquiry in the market for over 2000 cars, being the first portion of its requirements. Contracts for fabricated structural steel aggregated nearly 12,000 tons, of which a Milwaukee bank building was the principal item. Prices for light rails have been advanced. Pig iron for distribution in this territory, particularly from Southern furnaces, is held at decidedly firm quotations in the face of a spirited inquiry. Local furnaces also are asking an advance of 50c., or $14.50 at the furnace, but their position on this basis is not so clearly established. Under the influence of a steady demand from melters, and as a result of what is at least an apparent lack of scrap, prices for old material continue to advance.

Pig Iron.—Minimum prices for No. 2 foundry pig iron asked by Southern producers are based on $10.50, Birmingham, for immediate shipment, $10.75 for third quarter and $11 for the fourth quarter. Some interests are not considering any proposals for delivery in the last half under $11. The firmness of these prices has been tested by at least one desirable inquiry covering over 3000 tons for third quarter delivery, and at this writing none of the furnaces able to furnish the iron required has accepted a proposal on the basis of $10.50. Two sales of 800 to 1000 tons each are reported in the Rock River district and in the Tri-cities several sales of desirable tonnage are noted. In this city a large manufacturer of pipe and fittings bought a quantity of Ohio silvery iron. A Wisconsin stove manufacturer using malleable iron is in the market for approximately 1000 tons. In general a marked interest is being displayed by buyers regarding their last half requirements and the firmness of Southern prices has contributed in a measure to this activity. Northern furnaces apparently possess less inherent strength of their own and are able to assume a somewhat higher level of prices by virtue of the generally improved condition of the pig iron market. Sales have been made on the basis of $14.50 at furnace, both from Milwaukee and Chicago, but desirable business would undoubtedly call out concessions varying from 25c. to 50c. per ton. We quote for Chicago delivery, except for local irons, which are f.o.b. furnace, the following prices on prompt shipments:

Lake Superior charcoal	$15.75 to $16.50
Northern coke foundry, No. 1	14.75
Northern coke foundry, No. 2	14.25
Northern coke foundry, No. 3	14.00
Northern Scotch, No. 1	16.00
Southern coke, No. 1 foundry and No. 1 soft	15.35
Southern coke, No. 2 foundry and No. 2 soft	14.85
Southern coke, No. 3	14.35
Southern coke, No. 4	14.10
Southern gray forge	13.85
Southern mottled	13.85
Malleable Bessemer	14.00
Standard Bessemer	16.75
Basic	14.75
Jackson County and Kentucky silvery, 6 per cent	16.40
Jackson County and Kentucky silvery, 8 per cent	17.40
Jackson County and Kentucky silvery, 10 per cent	18.40

Rails and Track Supplies.—The purchase of rails by the Rock Island mentioned last week has now been increased to the total of the original inquiry, namely, 26,000 tons. Three other railroads have increased the tonnage covered by their contracts, and an unusually heavy total booked by the leading interest was largely due to the above rail orders. Prices of light rails have been advanced but the demand continues erratic. We quote standard railroad spikes at 1.50c., base; track bolts with square nuts, 1.90c., base, all in carload lots, Chicago; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.20c. to 1.25c.; 16 to 20 lb., 1.25c. to 1.30c.; 12 lb., 1.30c. to 1.35c.; 8 lb., 1.35c. to 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—The Wabash and Northern Pacific railroads distributed to the Haskell-Barker Car Company, Western Steel Car & Foundry Company and American Car & Foundry Company about 2000 cars, and the Santa Fé has entered the market for cars of various types totaling over 2000. Mill specifications for shapes continue to pile up, but the local mills are increasing their output and deliveries are somewhat improved. Contracts for fabricated steel have totaled nearly 12,000 tons and included 5325 tons for the First National Bank at Milwaukee, awarded to the Modern Steel Structural Company; 2218 tons, Kahn Building, San Francisco, to Milliken Brothers, and 1200 tons for the Anaconde lead plant at Grasselli, Ind., to the Kenwood Bridge Company. The American Bridge Company will furnish 560 tons for the Art Institute at Chicago, 396 tons for the Temple of Justice, Olympia, Wash., and 660 tons for a bridge near Boone, Iowa. Contracts also were awarded for the lock gates at Keokuk, 673 tons, and for 496 tons of bridge steel by the Midland Bridge Company. We quote for mill shipment, Chicago delivery, 1.33c. to 1.45c., and from store, 1.60c.

Plates.—While there has been no great amount of new business aside from the car orders mentioned above, specifications are being received by the mills in undiminished volume. Mill deliveries are slightly better, and customers under the necessity of receiving prompt shipment find themselves accommodated as far as possible. We quote for Chicago delivery, mill shipment, 1.33c. to 1.45c., and from store, 1.60c.

Sheets.—Recent orders for box cars have brought a pleasing volume of sheet specifications, and the demand from the general trade is well sustained. Prices generally are noticeably firmer. We quote Chicago prices as follows: Carload lots, from mill, No. 28 black sheets, 2.03c. to 2.08c.; No. 28 galvanized, 3.03c. to 3.08c.; No. 10 blue annealed, 1.53c. to 1.58c. Prices from store, Chicago, are: No. 10, 1.90c.; No. 12, 1.95c.; No. 28 black, 2.30c.; No. 28 galvanized, 3.35c.

Bars.—The bar iron mills are receiving the benefit of car orders, and some of them are operating practically at capacity. Prices are still low, but show promise of a gradual advance. Sales at 1.12½c. are less common, even for the more desirable business. Mill schedules on steel bars are filled for at least two months to come. We quote as follows, f.o.b. Chicago: Soft steel bars, 1.25c. to 1.33c.; bar iron, 1.15c. to 1.20c.; hard steel bars, rolled from old rails, 1.15c. to 1.20c. From store: Soft steel bars, 1.50c. to 1.55c., Chicago.

Old Material.—Prices have been advancing steadily, and the outlook is for continued strength. The limitations are the possibility of a heavy influx of scrap with the breaking up of winter. Railroad lists closed in the past few days brought out quotations decidedly higher than prevailed a week ago. Melters are obtaining purchased scrap with greater freedom, but their demands are still somewhat insistent. The Michigan Central Railroad is offering 1400 tons, the Frisco 1200 tons and the Lake Erie & Western 500 tons. Heavy melting scrap and shoveling steel are quotably 50c. a ton higher, as are No. 1 cast and both grades of wrought scrap. We quote, for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.

Old iron rails	$15.25 to $15.75
Old steel rails, rerolling	12.50 to 13.00
Old steel rails, less than 3 ft.	11.75 to 12.25
Relaying rails, standard section, subject to inspection	24.00
Old car wheels	13.00 to 13.50
Heavy melting steel scrap	11.00 to 11.50
Frogs, switches and guards, cut apart	11.25 to 11.75
Shoveling steel	10.75 to 11.25
Steel axle turnings	9.00 to 9.50

Per Net Ton.

Iron angles and splice bars	$13.25 to $13.75
Iron arch bars and transoms	14.25 to 14.75
Steel angle bars	11.00 to 11.50
Iron car axles	18.75 to 19.25
Steel car axles	16.00 to 16.50
No. 1 railroad wrought	11.75 to 12.25
No. 2 railroad wrought	10.75 to 11.25
Steel knuckles and couplers	10.75 to 11.25
Steel springs	11.00 to 11.50
Locomotive tires, smooth	13.00 to 13.50
Machine shop turnings	7.25 to 7.75
Cast and mixed borings	6.50 to 7.00
No. 1 busheling	9.75 to 10.25
No. 2 busheling	6.75 to 7.25
No. 1 boilers, cut to sheets and rings	7.50 to 8.00
Boiler punchings	13.00 to 13.50
No. 1 cast scrap	11.50 to 12.00
Stove plate and light cast scrap	9.75 to 10.25
Railroad malleable	11.00 to 11.50
Agricultural malleable	10.00 to 10.50
Pipes and flues	8.75 to 9.25

Wire Products.—With the ground in excellent condition and the outlook thus far favorable, it is thought that the curtailment of the early spring season during which farm repairs are made will be offset by later developments. The movement of material from dealers' stocks has been held back and mill shipments of second orders, especially fencing, have suffered accordingly. Wire nails have moved more freely. We continue to quote as follows: Plain wire, No. 9 and coarser, base, $1.58; wire nails, $1.78; painted barb wire, $1.78 to $1.83; galvanized, $2.08; polished staples, $1.83; galvanized, $2.13, all Chicago.

Cast Iron Pipe.—Important lettings have been lacking. A number of small lots up to 300 tons are reported. There is a disposition on the part of the makers to stand somewhat more firmly on the question of price. We quote as follows, per net ton, Chicago: Water pipe, 4-in., $27; 6 to 12-in., $25; 16-in. and up, $24.50, with $1 extra for gas pipe.

Philadelphia

PHILADELPHIA, PA., April 2, 1912.

The suspense which the trade has been under for several weeks in connection with a threatened strike of the anthracite and bituminous coal miners has been relieved by the agreement which has been reached by the bituminous interests. There has, however, been no agreement as yet in the anthracite district. In the anthracite field uncertainty still prevails, although it is expected that an agreement will be speedily reached. The movement in pig iron has been a trifle more active. Continued firmness in prices is noted, with an upward tendency in basic iron. Sellers continue undisposed to sell ahead at present prices, as some uncertainty still surrounds deliveries of coke. Finished material shows increasing strength. Specifications are coming to mills freely. Old material is stronger, although the market feels the effect of the financial difficulties of one of the principal scrap merchants.

Iron Ore.—Purchases of 100,000 ton lots of Lake ores have been made by two Eastern furnaces, while a smaller tonnage has been taken by another consumer. Negotiations are pending for several hundred thousand tons. Eastern ore is being offered more freely, usually at the old basis of prices. There has been no movement in foreign ore. Importations during the week include 4522 tons of Swedish, 5084 tons of Spanish and 22,300 tons of Cuban ore.

Pig Iron.—The volume of inquiry for both foundry and steel making grades has increased, some of which is for shipment over the third and fourth quarters of the year, for which deliveries consumers would enter orders, if possible, at current prices. Producers, however, show little disposition to sell beyond the second quarter, and some have practically withdrawn from the market on certain grades. The Pennsylvania Railroad has placed orders for some of the iron specified in its recent inquiry for second quarter, and it is expected that the bulk of the business will be closed this week. Several 1000 ton lots of No. 2 X foundry have been contracted for by melters in this vicinity for second quarter shipment. A more active movement in moderate lots is also noted. Some little malleable has been moved. Cast iron pipe makers continue to seek round lots of low grade iron, although but one definite inquiry, for 3000 to 4000 tons, is under consideration. A soil pipe maker has taken 1000 tons. There is still a good movement in Virginia foundry irons, one seller disposing of an aggregate of 5000 tons in small and moderate lots at $12.50, furnace, for second quarter, although occasional sales up to $13, for prompt delivery, are reported. Little movement in rolling mill forge iron is noted. Negotiations for a round block, under way last week, have, it is said, been suspended. With the increased activity of the steel mills more interest has been shown in basic iron. One sale of 2000 tons to a central Pennsylvania consumer, for prompt shipment, at $14.50, delivered, is noted, but the seller has now withdrawn that price, and upward of $15, delivered, is the more general quotation. Inquiries are in hand for a 2000 and a 4000 ton lot for early delivery. A Harrisburg melter is inquiring for upward of 10,000 tons, while an Eastern consumer has been feeling the market and would probably take 20,000 tons for forward delivery if ideas as to price were met. One Eastern melter has an inquiry out for 1500 tons of Bessemer iron, for second quarter delivery. A fair demand for low phosphorus iron continues, particularly for extended shipment. The following range of prices is named for prompt and near future delivery in buyers' yards in this vicinity:

Eastern Pennsylvania No. 2 X foundry	$15.00 to $15.50
Eastern Pennsylvania No. 2 plain	14.75 to 15.00
Virginia foundry	15.30 to 15.75
Gray forge	14.25 to 14.50
Basic	14.50 to 15.00
Standard low phosphorus	19.25 to 19.50

Ferroalloys.—Recent arrivals of ferromanganese have relieved the immediate scarcity, both for material under contract as well as prompt lots. Moderate sales for future delivery continue to be made at $41, Baltimore, although prompt lots readily bring $45 to $46, while still higher prices prevail for broken lots. The demand for either furnace or 50 per cent. ferrosilicon continues light.

Billets.—Orders continue to come out quite freely for small and moderate lots, both in rolling and forging billets. Some renewing of contracts for second quarter is reported at full prices, which for basic open-hearth rolling billets range from $22.40 to $23.40, delivered in this vicinity. Forging billets have been in fair demand and are quoted at $26.40 to $28.40, delivered, dependent on specifications. Mill activities continue on a more satisfactory basis.

Plates.—The recent higher rate of production continues, and the volume of new business and specifications coming in lends encouragement to the belief that the improvement will be maintained. Considerable urgent delivery business is reported and mills are decidedly firmer as to prices. For the ordinary run of business 1.35c., delivered, represents the usual quotation, although for particularly desirable business some mills will still do 1.30c.

Structural Material.—The proposed addition to the Cramp machine shop and the new Hotel Vendig are still held up. The bulk of the business has been of a miscellaneous character, of which the aggregate reaches a good total. Structural mills are somewhat more actively engaged, 75 to 80 per cent. about representing the productive rate. Prices are firmer, 1.35c., delivered, being easily done for miscellaneous material, although if any tonnage is involved 1.30c. is still available. Fabricated material prices do not show any great strength.

Sheets.—Eastern mills continue to operate at full capacity and orders are still being received at a rate slightly in excess of current capacity. More urgency for delivery is noted. Prices are firm and Western sheets are stronger at 1.95c. to 2c. for No. 28 delivered here. Eastern mills, making smooth, loose rolled sheets, easily obtain from ¼c. to ½c. per lb. advance over the outside quotation.

Bars.—A moderate run of business has been coming out and makers are adhering more firmly to the higher quotations. Some few contracts for iron bars for second quarter were closed at 1.25c., delivered, although for miscellaneous business 1.27½c. now appears to be the minimum, with 1.32½c. asked in some cases. Makers of steel bars still aim to get 1.30c., delivered in this district, although it is understood that 1.25c. can still be done.

Coke.—While the danger of a bituminous miners' strike has been averted there is still much uncertainty regarding the supply available in the near future and as high as $3.40, at oven, has been paid for prompt furnace coke, where immediate supplies were imperative. Little business in forward coke is passing, the adjustment of prices to meet conditions being awaited. A moderate volume of business is being done in prompt and near future foundry coke, but sales are usually small. Quotations are, to a large extent, nominal, the following range being named, per net ton, for delivery in this district:

Connellsville furnace coke	$4.15 to $4.60
Connellsville foundry coke	4.75 to 5.40
Mountain furnace coke	3.80 to 4.20
Mountain foundry coke	4.35 to 5.00

Old Material.—The tendency is toward higher prices. Advances have been obtained for heavy melting steel scrap, No. 1 railroad wrought, No. 1 forge fire and cast borings. Sales of No. 1 heavy melting steel scrap in 1000 ton lots are reported at $12.50 and $12.75, delivered. Forge fire scrap has been sold in round lots at $11, while small sales of No. 1 railroad wrought have been made at $15.25. As high as $9.25 has been paid for cast borings. The financial difficulties of Emanuel Dreifus & Co. have caused some excitement in the trade, but they may not have any direct bearing on the market. The following range of prices about represents the market for prompt deliveries in buyers' yards, eastern Pennsylvania and nearby points, taking a freight rate from Philadelphia

varying from 35c. to $1.35 per gross ton, for shipment ranging from prompt to the remainder of the year.

No. 1 heavy melting steel scrap and crops	$12.50 to $13.00
Old steel rails, rerolling (nominal)	14.00 to 14.50
Low phosphorus heavy melting steel scrap	15.25 to 15.75
Old steel axles	17.00 to 17.50
Old iron axles (nominal)	22.00 to 23.00
Old iron rails (nominal)	15.50 to 16.00
Old car wheels	12.50 to 13.00
No. 1 railroad wrought	15.25 to 15.75
Wrought iron pipe	12.00 to 12.50
No. 1 forge fire	11.00 to 11.50
No. 2 light iron (nominal)	6.75 to 7.25
Wrought turnings	9.00 to 9.50
Cast borings	9.00 to 9.50
Machinery cast	13.25 to 13.75
Railroad malleable (nominal)	11.75 to 12.25
Grate bars, railroad	10.00 to 10.50
Stove plate	10.00 to 10.50

Boston

BOSTON, MASS., April 2, 1912.

Old Material.—The improvement in the market for scrap has taken tangible form in an advance in prices on heavy melting steel and cast borings. However, transactions are still small in number and of inconspicuous tonnage, the change still being in sentiment largely. The prices quoted below are those offered by the large dealers to the producers and to the smaller dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points taking Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of $2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices.

Heavy melting steel	$9.00 to $9.50
Low phosphorus steel	11.45 to 11.95
Old steel axles	14.00 to 14.50
Old iron axles	17.00 to 18.00
Mixed shafting	13.00 to 13.50
No. 1 wrought and soft steel	10.00 to 10.50
Skeleton bundled	7.00 to 7.50
Wrought iron pipe	8.50 to 9.00
Cotton ties	7.00 to 7.50
No. 2 light	4.50 to 5.00
Wrought turnings	6.00 to 6.50
Cast borings	5.75 to 6.25
Machinery, cast	12.50 to 13.00
Malleable	8.75 to 9.25
Grate bars	6.00 to 6.50
Stove plate	8.00 to 8.50
Cast iron car wheels	11.75 to 12.00

Cleveland

CLEVELAND, OHIO, April 2, 1912.

Iron Ore.—The market has become quite active. A heavy tonnage has been sold and short time options on large business have been taken by furnacemen. Buyers appear to be doing more shopping around than usual, with the hope of getting price concessions. They are taking options on suitable ores in order to give them a little time to decide definitely how much tonnage they will buy or to see if they can find other grades that will answer their requirements at more attractive prices. There is considerable talk among sellers that the heavy buying movement which is expected may result in an advance in prices later in the season, and this talk is apparently having more or less effect upon furnacemen and is stimulating early buying. Although some ore is being offered at lower prices by one or two firms the recently established quotations are being maintained by most of the sellers. The reduction in price is expected to result in considerable buying of Lake Superior ore by Eastern furnaces, and some sales have been made in the Eastern market, though in the past week no considerable additions have been made to the tonnages heretofore reported. Some of the mining companies have decided not to sell their ores at present prices and have withdrawn from the market. Others having limited amounts are holding for prices slightly above the regular quotations and expect to be able to sell their small output at the higher prices. One interesting feature of the market is that sellers are refusing to put the usual clause in their contracts guaranteeing prices for the season. The omission of this clause leaves them free to make further price reductions at any time during the season should the situation require it, without being compelled to readjust to the new basis contracts previously made. Ore shipments during the first three months of the year were about the same as during the corresponding period about a year ago. Shipping orders are now larger than they have been at any time during the past three months. We quote prices as follows: Old range Bessemer, $3.75; Mesaba Bessemer, $3.50; old range non-Bessemer, $3.05; Mesaba non-Bessemer, $2.85.

Pig Iron.—The market on foundry grades is slightly firmer. One local seller who has been shading $13, at furnace, for No. 2 is now making minimum quotation of that price for out-of-town shipment, and the local price for Cleveland delivery is being better maintained at $13.25, furnace. For the last half delivery prices range from $13 to $13.50, at furnace. One Cleveland interest will sell through the last half at the same price as for the second quarter. Another Cleveland producer reports the sale of 1500 tons of No. 2 foundry for Cleveland delivery at $13.50, furnace, for last half. One important valley interest is quoting No. 2 foundry at $13.25 for the remainder of the year. There is only a limited amount of buying in this immediate territory, but considerable business, nearly all in foundry grades, is being closed for shipment in other territories. One interest reports the sale of three or four 1000-ton lots. We note the sale of 2000 tons of No. 2 Southern to a Canadian consumer and also the sale of 750 tons of Southern charcoal iron in the Pittsburgh district. The demand for Ohio silvery is quite active. A Detroit stove works is in the market for 1000 tons. Sales are being made at $15.50, furnace, for delivery through the remainder of the year. Southern iron is firmer. Some producers have advanced their prices to $10.75 for the third quarter and $11 for the fourth quarter, and others have made an advance to $11 for No. 2 for any delivery. Shipments on Northern grades are heavy and stocks were reduced considerably during March. We quote the following prices for prompt shipment and for the second quarter, delivered Cleveland:

Bessemer	$14.15
Basic	13.75
Northern foundry No. 2	$13.25 to 13.50
Southern foundry No. 2	14.85 to 15.15
Gray forge	12.50 to 12.75
Jackson silvery, 8 per cent. silicon	17.05

Coke.—The market is not active. Recent prices on foundry grades are being maintained. Sales are almost entirely in car lots. Some contracts for Virginia foundry coke have been renewed at $3 for the last half. Furnace coke is quoted at $2.15 to $2.25 per net ton, at oven. Connellsville foundry coke is quoted at $3 a ton.

Finished Iron and Steel.—Specifications were very heavy during the week, owing to the expiration of low price contracts on April 1. With but few exceptions consumers specified all the material due on their contracts. The contracts of those who failed to order all their tonnage were canceled. The new demand is light, but there is a fair volume of business in prospect. Some contracts are being placed for second quarter delivery. Two new warehouses in Toledo will require several hundred tons of soft steel bars for reinforcing. The demand for structural material has improved, but the work that is coming out requires only small amounts. The demand for bars is fairly active. Prices are firm. Steel bars are as a rule maintained at 1.15c., Pittsburgh, and structural material is held by some sellers at 1.20c., Pittsburgh. Sales of steel bars and shapes are being made at an advance of $1 a ton over the above for less than car lots. Plates are quoted at 1.15c. to 1.20c., Pittsburgh. The demand for sheets has improved, but consumers are mostly under contract. We quote black sheets at 1.80c. and galvanized sheets at 2.85c. for No. 28. The bar iron market continues dull. Prices are unchanged at 1.20c., Cleveland mill.

Old Material.—The demand is not active. Local mills made some purchases, but only in small lots. The market is easier on heavy steel scrap. Local dealers recently tried to advance prices 25c. a ton, but mills refuse to pay over $11.50 to $11.75. Local mills are still well supplied and are not in the market for much tonnage. Dealers regard the outlook as more favorable and are not offering large tonnages at current prices. The Erie Railroad received bids April 2 on about its usual tonnage. Dealers' prices, f.o.b. Cleveland, are as follows:

Per Gross Ton.

Old steel rails, rerolling	$12.25 to $12.75
Old iron rails	14.00 to 14.50
Steel car axles	17.50 to 18.00
Heavy melting steel	11.50 to 11.75
Old car wheels	12.00 to 12.50
Relaying rails, 50 lb. and over	22.50 to 23.50
Agricultural malleable	10.50 to 11.00
Railroad malleable	11.50 to 12.00
Light bundled sheet scrap	9.50 to 10.00

Per Net Ton.

Iron car axles	$18.50 to $19.00
Cast borings	6.75 to 7.00
Iron and steel turnings and drillings	7.25 to 7.50
Steel axle turnings	7.75 to 8.00
No. 1 busheling	9.50 to 10.00
No. 1 railroad wrought	11.00 to 11.25
No. 1 cast	11.25 to 11.75
Stove plate	9.00 to 9.25
Bundled tin scrap	11.00 to 11.50

Cincinnati

CINCINNATI, OHIO, April 2, 1912.

Pig Iron.—Southern producers have assumed a very firm attitude on the price question. Although there have not been enough sales to really test the market, $10.50, Birmingham, is the minimum available quotation on No. 2 foundry, even for prompt shipment. However, it is rumored that a firm offer might induce operators outside the Birmingham district proper to book business for immediate shipment at a few cents below the figure named. On the other hand, a number of Southern producers have their order books fairly well filled and are asking $10.75 for the third quarter and $11 for fourth quarter. The lower grades are very scarce and a nearby melter was forced to pay $10.50, Birmingham, for 100 tons of No. 3 foundry, to be shipped in the last half. A small lot of No. 2 soft was bought by a Canadian manufacturer, for April-July shipment, at $10.75 at furnace, and 750 tons of Southern charcoal was taken by an Eastern buyer at $22.50, Birmingham, shipments to extend through the remainder of the year. A southern Illinois company was able to book last week 1500 tons of Southern No. 2 foundry at $10.50, with shipments running through September. The local inquiry for 500 tons of Southern foundry grades is expected to be closed this week, and there is also an inquiry from Michigan for about 500 tons each of Northern and Southern foundry iron, for delivery in the last half. Northern No. 2 foundry is firm at $13.50, Ironton, for either prompt or deferred shipment; in fact, it is possible to purchase for delivery through the last half at this same price. Malleable is in poor demand. Neither producers nor consumers are able to predict what effect the coal situation will have on the iron market, nor do they appear anxious to crowd the market. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton, we quote, f.o.b. Cincinnati, as follows, for prompt shipment:

Southern coke, No. 1 foundry and 1 soft	$14.25 to $14.75
Southern coke, No. 2 foundry and 2 soft	13.75 to 14.25
Southern coke, No. 3 foundry	13.25 to 13.75
Southern coke, No. 4 foundry	13.00 to 13.50
Southern gray forge	13.00 to 13.50
Ohio silvery, 8 per cent. silicon	16.45 to 16.95
Lake Superior coke No. 1	14.95
Lake Superior coke No. 2	14.70
Lake Superior coke No. 3	14.45
Basic, Northern	14.70
Standard Southern car wheel	25.25 to 25.50
Lake Superior car wheel	19.00

Coke.—The market is still in a much disturbed condition. In the Connellsville district it is reported that prices slumped off the latter part of last week, but most agencies report the uncertainty over the effect of the coal strike has caused the majority of producers to stick to the advances recently made. However, contract figures are conceded to be more reasonable and yearly contracts for several leading 72-hr. foundry brands could be made around $2.50 per net ton at oven. There is no demand in this territory for furnace coke, except in small quantities for domestic use. Prompt shipment quotations in the Connellsville, Pocahontas and Wise County fields are again nearly the same, with $2 to $2.15 being asked for furnace coke and all the way from $2.65 to $3 being obtained for foundry grades. The shortage in rolling stock has inconvenienced many foundries that usually do not carry a large stock.

Old Material.—The situation is unchanged. While there is a more optimistic feeling in some circles, it has not been strong enough to affect prices. It is understood that a number of Western railroads will soon have good tonnages of scrap to offer. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations the selling prices f.o.b. at yards:

Per Gross Ton.

Bundled sheet scrap	$7.50 to $8.00
Old iron rails	12.25 to 13.00
Relaying rails, 50 lb. and up	20.00 to 21.00
Rerolling steel rails	11.00 to 11.50
Melting steel rails	9.00 to 9.50
Heavy melting steel scrap	9.25 to 9.75
Old car wheels	11.25 to 11.75

Per Net Ton.

No. 1 railroad wrought	$9.75 to $10.25
Cast borings	5.50 to 6.00
Steel turnings	5.75 to 6.25
No. 1 cast scrap	10.00 to 10.50
Burnt scrap	6.50 to 7.00
Old iron axles	15.75 to 16.25
*Locomotive tires (smooth inside)	11.25 to 11.75
Pipes and flues	7.00 to 7.50
Malleable scrap	7.50 to 8.00

Finished Material.—Mill agencies report a much better inquiry for structural material, and they expect an excellent trade in the spring and summer. Many large buildings are planned or under construction in the Central West, and it is also stated that a number of Western railroads will come into the market soon for a large quantity of bridge material. Local agencies ask 1.15c., Pittsburgh, for steel bars and 1.20c. for structural material, but it is understood that desirable business can be placed slightly below these figures. Local warehouse quotations remain at 1.60c. for steel bars and around 1.70c. for structural material. Sheets are in good demand and the recent advance in prices is well maintained.

Birmingham

BIRMINGHAM, ALA., April 1, 1912.

Pig Iron.—With the announcement last week that certain interests would take pig iron orders for the last half of the year at $10.50, there came to the surface several good sized contracts which were closed on that basis. One lot of 2500 tons, several lots of 2000 tons each and quite a number of 500 and 1000-ton orders were placed for last half delivery. Stocks of iron on the yards are showing a still further decline, and with a more pronounced scarcity of lower grades it would not be at all surprising to see spot iron bring a little premium this month. There is no likelihood of any material change in the producing rate, unless it be that some stack now running should be compelled to go out for repairs. The seeming willingness of consumers to come in now and cover for the remainder of the year at $10.50 has had the effect of making two of the interests that were quoting $10.50 for the last half advance their price still higher. It is doubtful, though, if any purchases will be made this week on any basis above $10.50 and quotations, therefore, may be reported as continuing, f.o.b. cars at furnace, Birmingham district, as follows:

No. 1 foundry and No. 1 soft	$11.00
No. 2 foundry and No. 2 soft	10.50
No. 3 foundry	10.00
No. 4 foundry	9.75
Gray forge	9.50
Standard basic	10.50
Off basic	10.00
Charcoal carwheel iron	$22.00 to 22.50

Cast Iron Pipe.—Prices are firmer, in sympathy with the very strong pig iron market. Inquiries continue to come along at a very satisfactory rate and small orders are booked every day. Producers are concerning themselves more now about the supply of raw material than about new business, as there is a marked scarcity of pipe-making iron in the South. Prices remain on the following basis, per net ton, f.o.b. cars at foundry, Birmingham district: 4 to 6 in., $23; 8 to 12 in., $22; over 12 in., average, $21, with gas pipe taking the usual differential of $1 per ton higher.

Old Material.—Dealers report a better feeling and with the strong pig iron market expect a much more satisfactory movement in all grades. Old rails and old car wheels are stronger, but not sufficient to change the market quotations. Dealers, therefore, continue the following schedule of prices, f.o.b. their yards here, all per gross ton:

Old iron axles (light)	$12.50 to $13.00
Old steel axles (light)	11.50 to 12.00
Old iron rails	11.50 to 12.00
No. 1 railroad wrought	10.50 to 11.00
No. 2 railroad wrought	9.00 to 9.50
No. 1 country wrought	6.00 to 6.50
No. 2 country wrought	5.50 to 6.00
No. 1 machinery	8.50 to 9.00
No. 1 steel	8.00 to 8.50
Tram car wheels	7.50 to 8.00
Standard car wheels	9.50 to 10.00
Light cast and stove plate	6.00 to 6.50

Coal and Coke.—With the announcement that there will be no general strike in the bituminous fields of the Central West there has been some let-up in the inquiries for coal, but the demand on this district continues very good with satisfactory prices. It now appears that Alabama coal fields will receive a satisfactory run of business through the usually dull spring and summer months. Coke is being held at a higher price than ruled at any time last year, and the best grades of foundry coke are bringing $3.50 to $3.75 at oven, with furnace coke bringing $2.50 to $3. The Virginia product was withdrawn from this market the past two weeks on account of the unusually heavy demands from other sections.

The Republic Iron & Steel Company's Pioneer furnaces at Thomas, Ala., produced 26,103 tons of pig iron in March. The highest previous record for the three furnaces in a single month was 25,521 tons.

San Francisco

SAN FRANCISCO, CAL., March 26, 1912.

Slight indications of betterment are observed in some departments, particularly in structural steel, but in the materials handled by local merchants the situation shows little change. The tonnage for March will doubtless show a fair increase over that of February or of March, 1911, but the movement in most lines is hardly normal. Contracts now being booked for second quarter delivery are hardly up to expectations, and specifications also show some decrease, as the local trade looks for no revival, at least for several months.

Bars.—The demand for soft steel bars has dropped off a little of late, and is limited mostly to small orders from the outside trade. Jobbers are keeping their stocks down to the narrowest possible compass, buying only in small lots. Prices, however, are much more satisfactory than last month. A very fair movement is noted in reinforcing bars, and the outlook for second-quarter business is good, but a large part of the tonnage is going to mills on the Coast. The resulting competition causes a rather unsettled feeling as to prices, and considerable business is reported at about 1.85c. Merchant bars, from store, San Francisco, are quoted at 2.20c. for steel and 2.10c. for iron.

Structural Material.—If all the contracts now pending are closed this week the March tonnage of structural material will be the largest in many months. The largest job awarded recently is the Kahn Bros. Building in Oakland, about 2600 tons, to the Judson Mfg. Company. Aside from this the only new contract reported on the coast is the Vancouver B. C. Hotel, 500 tons, taken by J. J. Coughlin, of that city. Locally, figures are in on a number of good-sized buildings, and fabricators are confident that most, if not all of them, will be placed within the next 10 days. The principal projects are: Tivoli Theatre, 900 tons; Liverpool, London & Globe Insurance Building; Greninger Building, and an apartment house at Powell and Sacramento streets. Several other plans will be up in a week or two. New inquiries are slow to appear in other coast cities, but there is considerable work in architects' hands. The State Armory job at Sacramento, Cal., has been held up indefinitely, but bids will probably be called for soon on the San Francisco armory, which will cost nearly $400,000. The Llewellyn Iron Works, Los Angeles, has a small lighthouse job. All work which has recently come up has been subject to close competition, both local and Eastern fabricators being anxious for work, and low prices prevail.

Rails.—Recent business in this vicinity is about up to expectations, several orders amounting to about 1000 tons each having been placed, in addition to a fair aggregate of smaller business. The outlook is favorable for continued buying on the part of small railroads in all parts of the coast, as more development work is planned by such concerns than for several years. Such light sections as are carried by jobbers, used mainly for mine and tramway operations, receive little attention.

Sheets.—The distributive movement of black and galvanized sheets has quieted down somewhat and merchants' orders for second quarter delivery have so far been very light. Riveted pipe manufacturers, however, are still consuming a heavy tonnage and look for little curtailment of operations through the summer.

Plates.—The tank business in the oil fields remains quiet, but there is a fair distributive movement of tank steel in other parts of the coast. A few large projects are coming up, requiring both tank and marine plates. The Union Iron Works has taken another steamship contract, a duplicate of the one booked recently, and more business of a similar nature is expected. Contracts have been let for the construction of seven large oil tanks for a new refinery near Martinez, Cal.

Merchant Pipe.—Orders for forward shipment, either from merchants or large consumers, are very light, the possibility of getting pompt delivery tending to prevent the accumulation of large stocks. The distributive trade, usually active at this season, is falling below that of January, with little prospect of improvement before September. Some waterworks business is coming out, but adds little to the aggregate tonnage. The oil situation shows little change. Many oil transportation lines are projected, but no definite inquiries are coming from this source. The town of Prince Rupert, B. C., received bids March 25 for 3800 ft. of 18-in. steel pipe.

Cast-Iron Pipe.—The recent business, though fair in the aggregate, is composed entirely of small lots for widely separated points and inquiries now in the market are of a similar nature. Some single projects requiring a considerable tonnage are, however, expected to be in the market in the near future, as plans are being made for several new gas plants, as well as important waterworks extensions. Lodi, Cal., is in the market for a small lot of 4-in. pipe and the city of Los Angeles opened bids March 26 for 146 tons of 8-in. class B pipe. The town of Orland, Cal., is taking figures on a complete waterworks, requiring 200 tons of cast-iron pipe in addition to tank, tower and pumps. The United States Pipe Company has an order for 600 tons from Orange, Cal., and the city of Sacramento split an order for 100 tons between two firms. The Pacific Gas & Electric Company has ordered 250 tons of 12 and 14-in. pipe for the Stockton, Cal., waterworks and the Western States Gas & Electric Company has placed a small gas pipe order for the same place. The city of Seattle, Wash., will soon be in the market for a large lot of hydrants and valves.

Pig Iron.—Local foundry operations show great fluctuation, but short periods of activity are recurring with more frequency and the consumption of pig iron seems to be increasing a little. While many plants are well stocked with pig iron, a good many small orders for Southern foundry iron are coming out, as the tonnage of foreign pig iron arriving has been light for many months and there is none of any consequence on the way. Prices are accordingly steady, remaining as for some time past. Chinese foundry iron is quoted at $23; English and Continental, ordinary brands, $22; No. 2 Southern foundry, $20.50.

Old Material.—Cast-iron scrap is moving off rather more freely, but offerings are too large to permit any advance in prices. Eastern buyers have purchased several thousand tons of steel melting scrap for shipment, which will reduce the accumulation on the coast to something like comfortable size, and the shipping movement is expected to bring out more demand from local markets. Rerolling rails are moving well on old contracts, but there is nothing new in the market. Prices are as follows: Cast-iron scrap, per net ton, $14; steel melting scrap, per gross ton, $11.50; wrought scrap, per net ton, $12.50 to $15; rerolling rails, per net ton, $11.

T. H. Speddy & Co., representing the Cambria Steel Company, Johnstown, Pa., for the sale of Cambria steel products, has opened offices in room 506 I. W. Hellman Building, Los Angeles, Cal.

Buffalo

Buffalo, N. Y., April 2, 1912.

Pig Iron.—The week has shown continued heavy inquiry for third-quarter and last-half delivery, principally for foundry grades, but including some malleable, and sales by Buffalo district furnaces aggregated about 25,000 tons of all grades. Prices are being very firmly held as a rule. One western New York furnace which has recently been accepting business at low prices has now made a sharp advance in its quotations. This, however, still leaves one furnace in the western New York group which is actively canvassing for orders. With the exception noted, the furnaces in this district are so largely booked up for first-half delivery that their unsold stocks are practically nil. Outgoing shipments on contracts are of very large volume. The Lackawanna Steel Company now has five of its seven blast furnaces in operation and it is probable that another furnace will be blown in shortly. The entire product of this company's furnaces is used in its own mills. For second and third-quarter delivery we quote as follows for Buffalo:

No. 1 X foundry	$14.00 to $14.50
No. 2 foundry	14.00 to 14.25
No. 2 plain	13.75 to 14.00
No. 3 foundry	13.50 to 13.75
Gray forge	13.25 to 13.50
Malleable	13.75 to 14.50
Basic	14.00 to 14.50
Charcoal	15.75 to 17.25

Finished Iron and Steel.—Specifications on contracts are coming forward in good volume, not only for bars, but for plates and shapes and almost all other lines of finished products. Deliveries from mills on a number of lines are becoming more extended, particularly plates. Business in sheets shows a marked improvement and the demand for materials for outdoor construction work and contractors' supplies is increasing. The ruling price for steel bars is 1.15c., Pittsburgh, and 1.20c. for plates and shapes for second-quarter delivery, quotations not being made for deliveries beyond July 1. The Lackawanna Steel Company reports large orders for rails, necessitating running double time in the rail department. At least one-half of the tonnage placed is for open-hearth rails, and the company is now operating 11 open-hearth furnaces

and has two additional furnaces under construction. Two of its bar mills are running double turn and one single turn. Business in fabricated structural materials continues to show healthy activity. Bids are being received this week for steel for the Strong Steel Foundry Company's new plant, Buffalo, about 400 tons, and figures will soon be taken for the rebuilding of the Masten Park high school, recently destroyed by fire and to be rebuilt from plans used for the Lafayette high school, taking about 1000 tons of steel. The Buffalo Structural Steel Company was low bidder for steel for the H. O. Company's mill and warehouse addition, 250 tons, and the American Bridge Company low bidder for the McCurdy-Norvell department store building, Rochester, 500 tons. The Mosier & Gummess Company, Buffalo, was low bidder on the general contract for the Bennett Park technical high school, Buffalo, for which sub-contract for fabrication and erection of 1340 tons of steel are still to be let. Contract for the 300 tons of steel for the St. Mary's Hospital, Niagara Falls, has finally been awarded to the C. F. Ernst Sons Iron Works, Buffalo.

Old Material.—The market shows increased activity in small lot transactions and a tendency toward a strengthening of prices: Consumers are still reluctant to pay dealers' prices and dealers are not anxious to sell, believing prices will be higher in the near future. We quote as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	$12.75 to $13.25
Low phosphorus steel	15.75 to 16.00
No. 1 railroad wrought	14.00 to 14.25
No. 1 railroad and machinery cast scrap	13.50 to 14.00
Old steel axles	18.50 to 19.25
Old iron axles	22.00 to 22.50
Old car wheels	12.00 to 12.25
Railroad malleable	12.50 to 12.75
Boiler plate, sheared	13.75 to 14.25
Locomotive grate bars	11.00 to 11.25
Pipe and tank	9.50 to 10.00
Wrought iron and soft steel turnings	7.50 to 7.75
Clean cast borings	6.75 to 7.25

The German Iron Market

Activity Continues Undiminished

BERLIN, March 21, 1912.

The active condition of the iron trade continues undiminished. While no price advances are to be reported this week, it is encouraging that the German market has apparently not been affected by certain reductions made last week in Belgium and England. In Belgium all classes of bars and plates for export were reduced 1 to 2 shillings per ton; while the news from England indicates that the export price of Continental plates has been marked down. These reductions are explained as due to the great English coal strike. The German strike disquieted the iron trade considerably, but apparently did little positive harm. In a few cases it was reported that several works of minor importance were embarrassed for lack of coal. Happily, however, the strike was called off two days ago, and whatever slight effects it may have had will be overcome within a week or two.

The Pig Iron Syndicate is continuing to sell iron for the second half-year, but the quotas have pretty nearly been sold out, hence it has refused to sell further amounts to certain dealers who have already exceeded the quantities allotted to them. The syndicate is showing a pretty stiff hand in making prices on supplementary orders for the June quarter. A statement was given out by the syndicate several days ago, saying that the demand for iron remains very heavy, some customers having hastened their demands for delivery by reason of the coal miners' strike.

Russia to Prohibit Exports of Iron Ore

From Russia it is reported that the Government is about to issue an order prohibiting the export of iron ore, in answer to a petition from the iron trade of Russian Poland. The prohibition would cause considerable inconvenience to certain German companies. It was mentioned in this correspondence several months ago that a great German concern had made arrangements for heavy shipments of ores from Nicolaieff, extending over a series of years. In 1910 Germany imported 489,000 tons of ordinary iron ores from European Russia, against 295,000 tons in 1909; also 97,400 tons of manganese ores, as compared with 67,800 tons in 1909. From Asiatic Russia imports of the former class of ores amounted to 290,000 tons in 1910, against 257,000 tons in 1909; and of manganese ores 227,800 and 94,000 tons respectively. The figures show a strongly increasing tendency.

The combination controlling ship plates reports that its shipments in February reached 21,500 tons, against 19,000 tons in January, and that new orders taken amounted to 23,000 tons. The Kontor, as the selling agency is called, is now under negotiation for renewal, and it is found that greater difficulties exist than had been expected, owing to the fact that some of the mills have put in claims for big increases in their quotas. A meeting will be held in April to thresh out the question of the renewal.

Further demands for increases of quotas in by-products have been sent in to the Steel Works Union, in addition to those mentioned last week. One important concern demands that the quotas in plates be raised 20 per cent. for the next quarter; Krupp asks that a similar increase be made for castings and forgings; while the de Wendel Company demands that the penalties on all B goods for excess shipments above allotments be abolished. All these motions are regarded as tactical moves in the fight for the renewal of the union. This will be resumed at a meeting to be held before the end of the month.

Exports of iron and steel in February reached a total of 479,694 tons, being the largest quantity since last July. Imports reached 48,700 tons, which was about the average rate of the past year. The excess of exports over imports in February was 430,994 tons, an excess that was greater than for any previous month except July, October and December, 1911.

British Outlook Improved

Renewal of German Steel Works Union Assured

(By Cable.)

MIDDLESBROUGH, ENGLAND, April 3, 1912.

The industrial outlook is clearing, with progressive resumption of operations in prospect. March pig iron shipments from Middlesbrough were 131,000 tons, including 37,000 tons to Germany. Japan is reported to have bought 5000 tons of Cleveland pig iron.

American Bessemer sheet bars have sold at 95 shillings c.i.f. Liverpool. Open-hearth blooms are now offered by independent Alabama steel interests. Tin plates are nominally unchanged, but forward deliveries are really unquotable.

The renewal of the Stahlwerks Verband for five years on about the same lines as before is now practically assured, the chief obstacles having been overcome. We quote the market as follows:

Cleveland pig iron warrants (closing Tuesday), 51s. 10½d.

No. 3 Cleveland pig iron, makers' price, f. o. b. Middlesbrough, 52s. 6d.

German basic steel bars, f. o. b. Antwerp, £5 8s.

German sheet bars, f. o. b. Antwerp, 95s.

German 2 in. billets, f. o. b. Antwerp, 92s.

Steel bars, export, f. o. b. Clyde, £6 12s. 6d.

Steel joists, 15 in., export, f. o. b. Hull or Grimsby, £6 10s.

Steel ship plates, Scotch, delivered local yard, £7 7s. 6d.

Steel black sheets, No. 28, export, f. o. b. Liverpool, £9 2s. 6d.

Steel rails, export, f. o. b. works port, £5 17s. 6d.

Tinplates, cokes, 20 x 14, 112 sheets, 108 lb., f. o. b. Wales, nominally 14s. 4½d. for prompt.

A Woodward Furnace Record.—The Woodward Iron Company will soon put out its No. 3 furnace at Woodward, Ala., for relining. The furnace has made 382,000 tons on the present campaign of about three years and nine months. The No. 1 furnace in the same group, which is to be torn down to be replaced by a 20 x 90 ft. stack, will be kept in blast while the No. 3 furnace is being relined, or probably for a period of six or seven weeks. The tonnage record of the No. 3 furnace is an excellent one in view of the low iron content of the Birmingham district red fossil ores. This furnace is 20 x 85 ft. and was the first Southern furnace to be equipped with five stoves.

New York

NEW YORK, April 3, 1912.

Pig Iron.—The market has grown considerably more active in the past week. Partly in view of the transactions in Lake Superior ore at low prices, and partly because of the uncertainty as to pig iron values caused by the cessation of coal mining in the anthracite region and the higher levels reached by coal and coke, consumers of foundry iron have been actively figuring on their supplies of pig iron for the second and third quarters. In some cases, also, there are negotiations for iron for the entire second half. Furnace companies have taken a firmer stand in nearly all districts, in some cases quotations being made that caused buyers to hesitate. The market at the moment shows this conflict of views, and quotations by various furnace companies are as much as 50 cents a ton apart. One Eastern inquiry for 10,000 tons has been closed up in the past week, half of the iron going to one pig iron interest. There have been a number of fair-sized sales out of the Buffalo district for shipment to eastern New York and New England. Eastern Pennsylvania furnaces have been asking higher prices for foundry iron. For basic the inquiry in that section has increased very considerably and probably 50,000 tons is now under negotiation. Large pipe interests have been in the market, and one in particular has made heavy purchases, chiefly of Southern iron. No. 3 and No. 4 Southern irons have been very difficult to obtain. All Southern furnaces are firmer and the $10.50 for second quarter and $10.75 for third quarter have been the basis of a number of sales of Southern No. 2 foundry. While there is no doubt as to the increase in activity, the situation as to prices is by no means clear. Some buyers take the view that as some of the recent advances have been due to the flurry over fuel supply the market may show some modification of the present firmer views of sellers as the fear of coal and coke shortage disappears. We quote as follows for Northern iron at tidewater: No. 1 foundry, $15.25 to $15.75; No. 2 X, $15 to $15.50; No. 2 plain, $14.75 to $15. We quote Southern iron at $15 to $15.50 for No. 1 foundry and $14.75 to $15 for No. 2 foundry.

Finished Iron and Steel.—Betterment is more pronounced than was the case last week. All the representatives of structural mills interviewed declared that they were holding to a minimum of 1.20c., Pittsburgh, for shapes and agreed to receiving a good run of general business. It is admitted that large attractive structural propositions only would catch lower prices than 1.20c., Pittsburgh. Fabrication prices seem to be above $40 a ton rather than under, $39 probably being low for a large job involving considerable material attractive to the shop. The plate business also is active and while 1.20c. is the general minimum, 1.15c., Pittsburgh, can yet be obtained for large tonnages. One Eastern plate mill is now operating double turn, the first this condition has happened in about a year and a half. Bars are firm at 1.15c. with business taken to July 1 only, but whether 1.15c. can now be shaded in the local market is not known, nothing having been learned of transactions of large sizes. March business of one large producer was 1000 tons better than that of February. Bar iron orders are also reported coming in at a satisfactory rate with stiffening in prices, particularly as one interest has withdrawn recent quotations of 1.22½c. to 1.25c., delivered in New York. One other interest has raised its prices on bolts, nuts and the like. Architects and builders are still quite busy on new projects. Some of the work which has or is about to reach the stage of the consideration of the steel work and not previously reported includes a 20-story loft building at Twenty-sixth street and Broadway, 3000 tons; addition to the Hotel Bossert in Brooklyn, 1200 tons; Thirty-ninth street ferry, Brooklyn, several hundred tons; cattle building, New York State Fair, Syracuse, perhaps 1000 tons; a Catholic church in Brooklyn; a new building for the Woman's Hospital, 109th street, and Travelers' Insurance Building, Hartford. Some of the structural work settled since the last report includes: 4700 tons for the J. I. Case plant, Racine, Wis.; 150 tons for two bridges for the Maine Central; 500 tons for the Baltimore & Ohio bridge work, and 600 tons for an apartment building in Hartford, all to the American Bridge Company; 1100 tons for the Graff Building on West Twenty-fourth street, to the Alfred E. Norton Company; 1000 tons for the Wilmington & Southern Traction Company, to the Phoenix Bridge Company; 1200 tons for plant extension of the Colwell Lead Company, to the Cambria Steel Company; 750 tons for the New England Gas & Coke Company, Everett, Mass., to the Boston Bridge Works; 400 tons for the Southern Paper Company near Mobile, Ala., to the Virginia Bridge & Iron Company; 12-story apartment on Fifty-fourth street and Seventh avenue to the Hinkle Iron Company, and 250 tons for seven bridges for the New York Central. The Lukens Iron & Steel Company has taken 400 tons of plates for two ships to be built in a local yard. Quotations remain at last week's figures with little or no business, however, done at the low prices: Steel bars, 1.26c. to 1.31c.; plain structural material and plates, 1.31c. to 1.36c.; bar iron, 1.30c. to 1.35c., all New York. Plain material from store, New York, 1.65c. to 1.75c.

Cast Iron Pipe.—Public lettings are few and the quantities involved are unimportant. On a recent letting at Boston the bids on 6 in. ran from $22.20 to $23.50 per net ton, delivered. It is now intimated that the additional heavy purchases of high-pressure pipe, to be made by New York City, will not occur until June. Private buying keeps up well, and foundries report their orders running somewhat above their shipments. Prices on carload lots of 6 in. continue to be quoted at $22 to $23, tidewater, per net ton.

Old Material.—Conditions have been complicated by the financial difficulties of an important Philadelphia dealer in old material, whose operations have plunged into uncertainty the sales and purchases of a number of other dealers in that city and in other Eastern markets, even including some in Pittsburgh. The covering of short contracts has caused some dealers to pay as high as $13, eastern Pennsylvania, for heavy melting steel scrap. The Panama Railroad Company, as agent for the Isthmian Canal Commission, is offering 430 tons of scrap from the Isthmus of Panama on which bids will be received on Thursday of this week. Quotations are as follows, per gross ton, New York and vicinity:

Old girder and T rails for melting	$10.25 to $10.50
Heavy melting steel scrap	10.25 to 10.50
Relaying rails	20.00 to 20.50
Rerolling rails (nominal)	12.00 to 12.50
Iron car axles	19.00 to 19.50
Old steel car axles	14.50 to 15.00
No. 1 railroad wrought	13.00 to 13.50
Wrought iron track scrap	12.00 to 12.50
No. 1 yard wrought, long	11.00 to 11.50
No. 1 yard wrought, short	10.25 to 10.50
Light iron	4.25 to 4.75
Cast borings	6.75 to 7.25
Wrought turnings	7.00 to 7.50
Wrought pipe	10.00 to 10.50
Old car wheels (nominal)	11.50 to 12.00
No. 1 heavy cast, broken up	11.00 to 11.50
Stove plate	8.75 to 9.00
Locomotive grate bars	9.00 to 9.50
Malleable cast	9.00 to 9.50

Ferroalloys.—Prices of 80 per cent. ferromanganese show a wider range because of the scarcity of spot supplies and a more active demand. For 80 per cent., $41, Baltimore, is still quoted for forward delivery and $42.50 for prompt delivery. For quick delivery, $45 to $46 has been asked and obtained. This price is also quoted for delivery from abroad, contingent on strike conditions permitting execution of the contract. It is believed that prices will be easier with the termination of the strike and the resumption of shipments. Fifty per cent. ferrosilicon, also more active, remains at $70, Pittsburgh, and less. An inquiry for 350 tons from the West is expected to result in a sale at about $68.

Metal Market

NEW YORK, April 3, 1912.

The Week's Prices

Cents Per Pound for Early Delivery.

	Copper, New York.			Lead		Spelter	
Mar.	Lake.	Electrolytic.	Tin, New York.	New York.	St. Louis.	New York.	St. Louis.
28	15.62½	15.50	43.00	4.20	4.12½	6.75	6.60
29	15.75	15.62½	43.00	4.20	4.12½	6.75	6.60
30	15.75	15.62½	.....	4.20	4.12½	6.75	6.60
April							
1	15.87½	15.75	43.30	4.20	4.12½	6.75	6.60
2	16.00	16.00	43.00	4.20	4.12½	6.75	6.60
3	16.00	16.00	43.00	4.20	4.12½	6.75	6.60

Copper prices are at and near 16c. with very little trading. Tin is inactive, but price well maintained. Lead is quiet at steady prices. Spelter is in somewhat stronger demand. Antimony prices are unchanged with a dull market.

New York

Copper.—Copper prices within the week reached 16c., despite the absence of any great demand for the metal. The quiet conditions are credited to consumers having well replenished their supplies while copper was

under 15.62½c. Good business was done up to that point by sellers. The advance of the market has been watched with keen interest since the latter part of last week despite the lack of any important trading. It is declared that some producers have not been altogether pleased with the rapidly advancing prices, preferring to maintain a state of affairs which would invite purchasers into the market at a good and reasonable figure. It is claimed by these producers that control of the market has been taken from them by speculative interests and that they have opposed a "runaway market." The higher prices of the metal have caused substantial advances in the prices of sheet copper and other finished products. The American Brass Company announced April 2 that sheet copper had gone up 1c. per pound in addition to recent increases, making the base price for hot rolled sheets 21c. and for cold rolled, 22c. per lb. Copper wire has been advanced ½c., making the new base price at mill in carload lots 17c. per lb. Despite the strong condition of the market in New York since April 1, the early cable from London today showed a decline of £1 12s. 6d., the price quoted being £69 for spot and £69 18s. 9d. for futures. The exports of copper this month have been 1627 tons.

Copper Averages.—The Waterbury average for the month of March was 15c. The average price of Lake copper for March, based on quotations in *The Iron Age*, was 14.87½c. and for electrolytic, 14.75c.

Pig Tin.—The pig tin market has been absolutely without exciting feature, although prices have maintained an average of practically 43c. Consumers have been keeping out of the market, having supplied their needs previously. The monthly statistics for March are regarded as very favorable in view of the conditions abroad. The figures show that there was delivered into consumption during the month 4000 tons and that there arrived at Atlantic ports about the same amount, 4074 tons. The total visible supply in both Europe and the United States March 31, 1912, was 15,694 tons. The principal domestic feature has been the recent heavy arrivals which more than meet demands immediately in prospect. The arrivals of tin this month have been 1220 tons and there is afloat 2775 tons. The price of spot tin in London is quoted to-day at £196 5s. and futures at £192. Tin is quoted in New York to-day at 43c. for spot and 42.87½c. for April delivery.

Tin Plates.—The most interesting feature of the tin plate situation is the further advance in plates laid down at Swansea, Wales, which have gone to 14s., the second advance within 10 days. This last advance is from 13s. 10½d. The price of 100-lb. coke plates continues at $3.54, New York.

Lead.—The lead situation is extremely quiet as a result of the big business which was done at the low prices that recently prevailed. The American Smelting & Refining Company's price is 4.20c., New York, and 4.12½c., St. Louis. Independents have been getting business at prices as high as 4.22½c., St. Louis, and 4.37½c., New York. Special brands of lead have sold at 4.50c.

Spelter.—A quiet but better demand exists for spelter because of the needs of a few large consumers who found their supplies inadequate and must soon be buyers. For good brands of spelter 6.75c. to 6.80c., New York, is asked with corresponding prices in St. Louis. The Waterbury average for spelter for the month of March is 7.17c.

Antimony.—The prices of antimony stand as quoted last week: Cookson's at 8c., Hallett's at 7.75c., Hungarian and Chinese grades at 7.75c.

Old Metals.—The market continues strong and selling prices have been advanced as follows:

	Cents per lb.		
Copper, heavy and crucible	14.50	to	14.75
Copper, heavy and wire	14.25	to	14.50
Copper, light and bottoms	13.25	to	13.50
Brass, heavy	9.50	to	9.75
Brass, light	7.50	to	7.75
Heavy machine composition	12.00	to	12.25
Clean brass turnings	9.00	to	9.25
Composition turnings	10.50	to	11.00
Lead, heavy			4.00
Lead, tea			3.75
Zinc, scrap			5.25

Chicago

APRIL 2.—The feature of the market has been the rapid advance in copper. The prospect is for still higher quotations. Other metals show little change beyond the usual fluctuations. We quote as follows: Casting copper, 15.75c. to 16c.; Lake, carloads, 16.25c.; pig tin, carloads, 44.50c.; small lots, 46.50c.; lead, desilverized, 4.25c. to 4.30c. for 50-ton lots; spelter, 6.30c. to 6.90c.; Cookson's antimony, 8.50c. and other grades, 7.50c. to 8c. in small lots. Sheet zinc is $8.60, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount, in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots: Copper wire, crucible shapes, 13c.; copper bottoms, 11.50c.; copper clips, 12c.; red brass, 11.25c.; yellow brass, 8.75c.; lead pipe, 3.60c.; zinc, 4.75c.; pewter, No. 1, 26c.; tinfoil, 34c.; block tin pipe, 37c.

St. Louis

APRIL 1.—The metal markets have shown strength in most items and the demand has been of fair dimensions. Lead is strong for spot, Missouri brands, at 4.20c. to 4.25c. Spelter is a little lower at 6.50c. for spot, with futures ranging a little lower. Tin is higher at 43.60c. Copper is sharply better at 16.10c. for lake and 15.95c. for electrolytic. Antimony, Cookson's, is considerably stronger at 8.35c. In the Joplin ore district during the week the price of zinc ore showed a tendency to be weaker at the first and then strengthened at the close and brought as high as $52 per ton on the 60 per cent. basis, choice lots reaching $55. The range ran down to $48, especially in the outlying districts and among the small producers. Calamine production continues at a minimum, and it is bringing $22 to $24 per ton, the choicest lots commanding $30. Lead ore was stronger at $52 to $57 per ton. Miscellaneous scrap we quote as follows: Light brass, 5c.; heavy brass and light copper, 9c.; heavy copper and copper wire, 10c.; lead, 3.50c.; zinc, 3.50c.; pewter, 21c.; tinfoil, 31c.; tea lead, 3c.

Iron and Industrial Stocks

NEW YORK, April 3, 1912.

The stock market has been much stronger, the industrial stocks showing especially good advances. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chalm., com...	½- 3	Nat. En. & St., pref.	93 - 94
Allis-Chalm., pref...	3¾- 7	Pressed Steel, com.	33 - 34½
Bald. Loco., com...	53½- 56	Railway Spring, com.	31½- 31¾
Bald. Loco., pref...	105⅛-106⅛	Railway Spring, pref.	100½-100⅝
Beth. Steel, com...	32½- 35	Republic, com.....	21 - 22⅜
Beth. Steel, pref...	61 - 63⅜	Republic, pref.....	71⅜- 74
Can, com.....	19⅞- 22⅞	Sloss, com.....	46 - 46⅞
Can, pref.....	102 -105⅞	Sloss, pref.....	105
Car & Fdry., com...	56 - 57½	Pipe, com.....	16 - 16¼
Car & Fdry., pref...	117	Pipe, pref.....	53½
Steel Foundries.....	30¼- 32½	U. S. Steel, com....	67⅛- 69⅞
Colorado Fuel.....	29½- 31¼	U. S. Steel, pref...	111⅜-113¼
General Electric....	165 -168½	Westinghouse Elec..	76 - 81⅞
Gr. N. Ore Cert...	41¼- 44	Va. I. C. & Coke.....	63
Int. Harv., com....	113⅜-116	Chic. Pneu. Tool....	49¾- 51
Int. Harv., pref....	120¼-121	Cambria Steel.....	41 - 44¾
Int. Pump, com....	30 - 31⅜	Lake Sup. Corp.....	29½- 30⅜
Int. Pump, pref....	81⅞- 83	Pa. Steel, pref.....	101
Locomotive, com....	38¾- 39¾	Crucible Steel, com..	11¾- 12½
Locomotive, pref.....	110	Crucible Steel, pref.	82 - 83¼
Nat. En. & St. Com.	16 - 17¾		

Stockholders of the B. F. Goodrich Company, Akron, Ohio, have authorized an increase in the capitalization of the company from $20,000,000 to $45,000,000. Each holder of common stock will receive two and seven-tenths shares, while each holder of the preferred will receive one and two-tenths shares of the new stock. In addition, each holder of common stock will receive $78 in cash. The new stock will likely go on the market at between $75 and $80 a share, based on the price at which the old stock has recently been selling, $280 a share.

Dividends Declared

The Westinghouse Electric & Mfg. Company, 1 per cent, on the common stock, payable April 30, and regular quarterly, 1¼ per cent. on the preferred stock, payable April 15. The last common dividend was paid in 1907. It is announced by the company that the question of the next dividend will not be considered for six months.

The National Fireproofing Company, regular quarterly, 1 per cent. on the preferred stock, payable April 15.

The American Seeding Machine Company, regular quarterly, 1½ per cent. on the preferred and 1 per cent. on the common stock, payable April 15.

The Chicago Pneumatic Tool Company, regular quarterly, 1 per cent., payable April 25.

The Pittsburgh Coal Company, regular quarterly, 1¼ per cent. on the preferred stock.

The Westinghouse Electric & Mfg. Company, 1 per cent. on the common stock, payable April 30, and regular quarterly, 1¾ per cent., on the preferred stock, pay-

able April 15. The last common dividend was paid in 1907. It is announced by the company that the question of the next dividend will not be considered for six months.

St. Louis

ST. LOUIS, Mo., April 1, 1912.

The buying movement which has been gathering force in its undercurrent in recent weeks is showing the effect on the surface. In the past seven days business has run to a good total in all divisions with firm prices and in some directions a tendency to raise the existing quotations. Inquiries and collections continue good.

Pig Iron.—Demand has broadened and inquiries are not only more widely spread over the trade territory but are for larger quantities. They have not, however, reached exceptional proportions. Sales include quite a number of lots ranging from 100 to 300 tons, one of 1000 tons of Northern foundry for second and third quarter delivery, one of 600 tons for the same delivery, one of 500 tons of malleable for last half delivery and one of 500 tons of Lake Superior charcoal carwheel iron also for last half. Inquiries now range as high as 1000 tons, but the bulk averages 150 tons. Little is doing in basic. The quotations are firm at $10.50 for No. 2 Southern, Birmingham basis, and $13.50 for No. 2 Northern, Ironton basis. Some representatives are asking 25c. advance on small lots and getting it where quick delivery is sought.

Coke.—The coke situation seems a little easier. There has been no drop in the prices as yet, but representatives of the ovens do not look for a drop back to the figures that prevailed before the sharp upturn began. For Connellsville and Virginia best 72-hr. selected the figure at present writing is $3 to $3.25 at oven. By-product coke is also maintaining its price.

Finished Iron and Steel.—The run of orders has kept up, but no large individual contracts have been placed. Plates are moving on contract only, but the total is satisfactory. In standard section steel rails the only order of the week was for 3700 tons from the Terminal Railroad Association of St. Louis. There are several inquiries in the market, but all from propositions not yet financed. A survey discloses that from the tonnage standpoint the current business here is only surpassed in the past five years by that of the early spring of 1907.

Old Material.—The scrap market is still in a most uncertain condition and all interested seem to be waiting to see which way the cat will jump. There is an impression that the next movement will be downward as a result of the spring weather permitting the picking up of quantities sufficient to overload the market, though this may not actually develop. The only lists out during the week were those of the Frisco, 1200 tons, and the Missouri Pacific, 1500 tons. These will close later in the present week and there is no indication just now how they will go. We quote prices, f.o.b. St. Louis, as follows:

Per Gross Ton.	
Old iron rails	$14.00 to $14.50
Old steel rails, re-rolling	11.00 to 11.50
Old steel rails, less than 3 ft.	11.25 to 11.75
Relaying rails, standard section, subject to inspection	21.50 to 22.00
Old car wheels	12.50 to 13.00
Heavy melting steel scrap	10.50 to 11.00
Frogs, switches and guards cut apart	10.00 to 10.50
Per Net Ton.	
Iron fish plates	$12.50 to $13.00
Iron car axles	17.50 to 18.00
Steel car axles	15.00 to 15.50
No. 1 railroad wrought	11.00 to 11.50
No. 2 railroad wrought	10.00 to 10.50
Railway springs	9.25 to 9.75
Locomotive tires, smooth	11.00 to 11.50
No. 1 dealers' forge	8.00 to 8.50
Mixed borings	6.00 to 6.50
No. 1 bu'heling	8.50 to 9.00
No. 1 boilers, cut to sheets and rings	7.50 to 8.00
No. 1 cast scrap	10.00 to 10.50
Stove plate and light cast scrap	8.00 to 8.50
Railroad malleable	8.50 to 9.00
Agricultural malleable	7.50 to 8.00
Pipes and flues	7.50 to 8.00
Railroad sheet and tank scrap	7.00 to 7.50
Railroad grate bars	8.00 to 8.50
Machine shop turnings	7.00 to 7.50

Julian Kennedy, Bessemer Building, Pittsburgh, consulting engineer for the Brier Hill Steel Company, Youngstown, Ohio, states that the initial plant will consist of seven 75-gross ton basic open-hearth furnaces, one 350-ton metal mixer, a 42-in. blooming mill, and finishing mills to roll small billets and sheet and tin bars. Within the next week or two the placing of contracts will probably be started.

Baltimore Industrial Notes

It has been announced that the Title Guarantee & Trust Company will have plans prepared by Joseph Evans Sperry for a seven-story office building to be erected at the southwest corner of Lexington and St. Paul streets. Details have not yet been considered.

The Chesapeake Iron Works has had a better run of miscellaneous small business in building and ornamental iron and steel work. A very fair contract for alterations to the Fifth Regiment Armory has been booked. A somewhat better inquiry for moderate building work is reported. Plant activity has increased slightly during the month.

Recommendation in the matter of the award of the contract for the building of the Gunpowder River dam in connection with the city water supply, for which bids have been received, is expected from the water board at an early date. Litigation in connection with the acquirement of certain property has held up the award. C. B. Clark & Co. were the low bidders for the work.

Wallace Stebbins & Sons report a very fair business in general supplies. The demand for engines and boilers has been less active, although moderate sales have recently been made, including boiler installations for the Excelsior Brick & Pottery Company, Baltimore, and several canning factories. A contract for extensive pipe work in connection with the canning plant of Wacker & Davis, Betterton, Md., has also been entered.

The W. F. Assau Canning Company, in order to provide additional facilities in its plant, has awarded a contract to the Consolidated Engineering Company for a two-story brick and concrete warehouse, 80 x 114 ft., to be erected at Boston and Streeper streets. As the new building will be used solely for warehouse purposes no mechanical equipment will be needed.

J. D. Adt has completed the purchase of additional machine tool equipment. Business is reported fully up to that of February and the plant continues to operate at full capacity. Numerous orders for special machinery for tobacco working purposes have been booked. The export demand has, however, been less active. Considerable business in elevators is being figured on and the outlook for more active general business is considered quite favorable.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, recently offered prizes to its employees making valuable suggestions on measures of economy in the various departments in March, and has awarded money prizes to six in different departments who submitted suggestions that were adopted.

The Champion Rivet Company, manufacturer of Victor boiler rivets, Cleveland, Ohio, has appointed as its direct St. Louis and Southwestern agent the Corby Supply Company, of which J. B. Corby is president, 1822 to 1824 Locust street, St. Louis, Mo.

The break up of winter and accompanying heavy rains have caused serious floods and great damage to property in the Mississippi and Missouri valleys as well as in some sections of the South. At points along the Mississippi the river has risen higher than ever before.

The new technical high school of Jersey City, N. J., described in *The Iron Age* of March 21, page 753, is equipped with transmission furnished by the Dodge Mfg Company, Mishawaka, Ind., which was sold through general contractors, Watson & Flagg, New York City.

The furnace of the New York State Steel Company at Buffalo was blown in this week after an idleness of many months. For the present foundry iron will be produced for the general market.

Sheridan furnace of the Berkshire Iron Company, Sheridan, Pa., was blown in April 1.

Personal

R. H. Flaherty, late of the United States Steel Corporation and now head of the mining department of Mackenzie, Mann & Co., is investigating the iron-ore deposits of British Columbia, in connection with the projected establishment of a large steel plant at Port Mann.

Referring to the article describing the plant of the Portsmouth Steel Company, Portsmouth, Ohio, which appeared in *The Iron Age* of March 28, we are advised that the sheet and jobbing mill addition to the plant was designed and built by the consulting engineer of the company, Frederick E. Fieger, House Building, Pittsburgh. Mr. Fieger also prepared plans for the installations of the turbo-generator set and the chain grate stokers in the three boiler houses.

H. L. Waterman, who has been general New York sales agent of the Cambria Steel Company since 1895, has resigned, effective April 1, and L. B. Morris, who has been New York sales agent in charge of merchant steel since 1900, assumed entire charge of the New York office April 1 under the title of district sales manager.

John Fritz has been elected an honorary member of the Verein deutscher Eisenhuettenleute, which met at Duesseldorf, Germany, last week. This is the technical association of German iron and steel manufacturers corresponding to the Iron and Steel Institute and the American Iron and Steel Institute.

H. A. Smith, who for the past eight years has been manager of the machinery department of the Syracuse Supply Company, Syracuse, N. Y., has resigned and has organized the H. A. Smith Machinery Company, in the same city.

D. C. Tuttle, formerly with Stone & Webster, engineering corporation, Boston, and more recently of the engineering department of the Spring Valley Water Company, San Francisco, has entered the firm of David Bixler & Co., 233 Sansome street, San Francisco, Cal. He has been appointed manager of the machinery department in charge of sales of construction machinery and equipment in California and Nevada.

John H. Long, for the past eight years sales engineer for the William Tod Company, Youngstown, Ohio, has resigned to take a similar position with the United Engineering & Foundry Company. His headquarters will be in Youngstown.

W. E. Greene, formerly with the W. Bingham Company, wholesale and retail hardware, Cleveland, Ohio, has been appointed manager of the store of the Boston Belting Company at 100 Reade street, New York City.

F. M. Bowman, secretary; Wayne Rawley, manager structural works, and A. Povard, engineer, of the Riter-Conley Mfg. Company, Pittsburgh, Pa., have resigned these positions and are organizing a large manufacturing concern in connection with the Blaw Steel Centering Company, manufacturer of steel forms for concrete construction, Pittsburgh.

W. H. Underwood, formerly city sales agent of the Triumph Electric Company, Cincinnati, has resigned to accept a position in the sales department of the Domhoff & Joyce Company, of the same city.

Robert Field has charge of the coke department of the Reliance Coal & Coke Company, Cincinnati, a new company that recently took over the business of the Cincinnati Gas Coke, Coal & Mining Company.

W. A. Everson, formerly with the Hamilton-Otto Coke Company, Hamilton, Ohio, has accepted a position as salesman for the Domhoff & Joyce Company, Cincinnati.

James T. McCleary, secretary of the American Iron and Steel Institute, and Raynal C. Bolling, assistant general solicitor for the United States Steel Corporation, were among the speakers at the sixteenth annual meeting of the American Academy of Political and Social Science at Philadelphia, March 29 and 30. The general topic was "The Effect of Industrial Combinations on Labor Conditions."

H. S. Fleming, New York, has been in the Birmingham district recently in connection with the proposed consolidation of the Alabama Consolidated Coal & Iron Company and the Southern Iron & Steel Company. His report will be made to English capitalists, who are expected to furnish a portion of the new capital required for the consolidation.

Anatole Mallet, Paris, France; Dr. Carl Gustav Patrick De Laval, Stockholm, Sweden, and Dr. Rudolf Diesel, Munich, Germany, have been elected to honorary membership in the American Society of Mechanical Engineers. M. Mallet has been engaged on various mechanical questions since 1867, among which are steam engines with double expansion and the application of this system to locomotives. Dr. De Laval in his earlier years did important work in developing processes for the manufacture of steel; but is best known through his invention of the centrifugal cream separator and other apparatus for the use of dairies and the De Laval steam turbine. Dr. Diesel is widely known as the inventor of the Diesel engine.

Rickard & Sloan, Inc., Evening Post Building, 20 Vesey street, New York City, composed of William L. Rickard and Clifford A. Sloan, will conduct an advertising business, giving particular attention to the planning and managing of advertising campaigns for concerns engaged in the manufacture of mechanical and electrical apparatus and accessories.

Obituary

GEO. E. SLATER, connected with the Cleveland office of the Republic Iron & Steel Company, died March 28 of pleuro-pneumonia, aged 35 years. He had been connected with the selling offices of the Carnegie Steel Company and the Republic Company in several different cities. His first employment was in the office of the Bassett-Presley Company, Cleveland. He was a brother of James E. Slater, sales agent of the National Malleable Castings Company, Cleveland.

HERMAN WOLF, president of the American Steel Wool Mfg. Company, New York, died March 28, aged 53 years.

The annual election of officers of the New York Metal Exchange took place April 1. James E. Pope was re-elected president; A. B. Hall, re-elected vice-president, and Robert L. Crooke, re-elected treasurer. The following were chosen as members of the board of managers: B. Hochschild, American Metal Company, Ltd.; H. W. Hendricks, Hendricks Bros.; G. E. Behr, Behr & Steiner; Emil Paerwald; Edwin Groves, James W. Phyfe & Co.; W. Parsons Tood, Quincy Mining Company; Eric Benjamin, J. H. Lang, L. Vogelstein & Co. J. Langeloth, C. J. Marsh, E. J. Keane, P. R. Jenrings and Humphrey D. Bond were elected to the Arbitration Committee.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, has placed a contract with the William Tod Company, of that city, for two condensing cross-compound crank and flywheel pressure pumps, 26 and 44 by 36 in., with two double-acting plungers, 8 x 36 in., with a capacity of 1500 gal. per min. at 600 lb. per sq. in.

The Scherzer Rolling Lift Bridge Company, Monadnock Building, Chicago, reports substantial growth in its business. Recent orders include notable foreign contracts, among which is a double track railroad and combined highway bridge for the Great Central Railway, England, across the Trent River, having a movable span of 160 ft. and an extreme width of 53 ft. 6 in. This will be the widest and heaviest movable bridge so far constructed in Great Britain.

The New York section of the American Peat Society will hold a meeting at the Chemists' Club, 50 East Forty-first street, New York, on the evening of April 9. Among the addresses to be made at this meeting will be one on "Fuel Conservation" by Dr. Joseph A. Holmes, director Bureau of Mines, Washington, D. C., and another on "Peat Fuel Is a Success in Europe; Why Not in America?" by Prof. Charles A. Davis, peat expert of the same bureau.

Pittsburgh and Vicinity Business Notes

The Pennsylvania Engineering Works, New Castle, Pa., is building two 500-ton blast furnaces, with 10 stoves and extensive gas washer equipment, for the Minnesota Steel Company, Duluth, Minn.; a 600-ton metal mixer for the Lackawanna Steel Company, Buffalo, N. Y., and a Steinbart washing plant for the Bethlehem Steel Company, South Bethlehem, Pa.

The People's Natural Gas Company of Pittsburgh has received a franchise to furnish natural gas to the city of Altoona, Pa. It is probable that the company will buy a large tonnage of pipe for this purpose.

The State Line & Lake Erie Railroad, organized some years ago by the Jones & Laughlin Steel Company, and intended to form a part of its projected railroad between Pittsburgh and Geneva Harbor, Ohio, has been dissolved by formal order of the common pleas court of Allegheny County. The project has been dropped.

The board of directors of the Union Switch & Signal Company, Pittsburgh, has been increased from seven to nine. John R. McCune, president of the Union National Bank of Pittsburgh, and W. D. Uptegraff have been elected as new directors.

The New Castle works of the Carnegie Steel Company in the week ended March 23 produced 16,271 tons of Bessemer steel ingots and 14,093 tons of sheet and tin bars, against the best previous record for a similar time of 15,552 tons of ingots and 13,678 tons of sheet and tin bars, made in January, 1906.

The Bethlehem Steel Company, South Bethlehem, Pa., has placed an order with the Clark Car Company, Oliver Building, Pittsburgh, for 100 center dump coke cars. The cars will be of the hand operated type with balanced doors.

The monthly meeting of the Pittsburgh Foundrymen's Association was held in the Fort Pitt Hotel on Monday evening, and was preceded by a dinner. W. H. Cameron, manager of the casualty department of the American Steel Foundries, Chicago, presented a paper on the subject of "Safety Appliances for Foundries." Views were shown showing different appliances in use at the plants of this company.

Joseph G. Armstrong, director of public works, Pittsburgh, is taking estimates on the foundations and appurtenances for a new pumping station to be erected at Aspinwall, Pa. The estimated cost of the building is $190,000.

The Federal Engineering Company, Pittsburgh, has placed an order with James T. Castle, Arrott Building, for a 750-hp. cross compound non-condensing Buckeye engine, to be direct connected to a Crocker-Wheeler generator, to be installed in the power plant of J. L. Stifel & Sons, Wheeling. Mr. Castle, who represents the Buckeye Engine Company, Salem, Ohio, has opened an office for the company in the Ingalls Building, Cincinnati, in charge of Edward F. Wilson, formerly connected with the Pittsburgh office.

The Hazel-Atlas Glass Company, Washington, Pa., has placed an order with the Foos Gas Engine Company, represented by the Tranter Mfg. Company, Water street, Pittsburgh, for two vertical engines to be direct connected to 200 kw. generators, for installation in its No. 2 plant.

E. D. Graff, Pittsburgh representative of Joseph T. Ryerson & Son, of Chicago, has moved his offices from the Frick Building to 2202 Oliver Building.

It is not likely that any merger of interests of the Phillips Sheet & Tin Plate Company and the La Belle Iron Works will take place. It is possible that the Phillips Company may erect an open-hearth steel plant to supply its own sheet and tin bars, but as yet there has been no official consideration of this project. It is the largest independent consumer of sheet and tin bars, having a total of 44 hot sheet and tin mills.

The I. & E. Greenwald Company, Cincinnati, manufacturer of steam engines and special machinery, of which John H. Gibson is receiver, has filed its inventory in the insolvency court of that city. The assets amount to $302,890.40, and the liabilities about $111,000. Arrangements have been practically made to continue the company's business.

Factors in Foreign Trade

The Bureau of Manufactures now has in press a bulletin that will no doubt find a permanent place on the desk of every manufacturer interested in foreign trade. In its 56 pages will be found answers to questions asked by every manufacturer sending out trade literature or opening correspondence with foreign firms: What language is it best to use? In what currency and what weights and measures should prices be quoted? What postage should be placed on the catalogue or the letter? Can I prepay a reply from the prospective customer? Is there a parcels post?

The bulletin answers these and other questions for each country in a concise manner. Supplementing these statements are tables for converting the money of foreign countries into that of the United States and a comparison of prices for countries in which both the monetary unit and the units of weight and measure differ from those used in the United States. For example, the latter tables show the reader at a glance what is the comparative price per meter in Mexican currency of a cloth quoted at 50 cents per yard in United States currency; or the price per pound in United States money of an article quoted at 30 francs per kilo in French currency.

Currency conversion tables and price comparisons are given for over 30 countries. Foreign postage rates and the parcels-post regulations are summarized, and a list is given of the countries in which international reply coupons are valid. Copies of the bulletin, which is entitled "Factors in Foreign Trade," will be available for distribution at an early date, and those desiring it should make application to the Bureau of Manufactures, Department of Commerce and Labor, Washington, D. C.

Large Deal in Texas Ore Land

Our Texas correspondent states that one of the largest transactions in iron ore lands that has ever taken place in that State will be formally consummated as soon as the titles to the several different properties are passed upon and approved. The purchaser is the Brown Ore Development Company, Ore City, Texas, in which Charles M. Schwab is stated to be largely interested, and which is developing large iron ore deposits near Ore City. The transaction which is now pending involves the purchase of 25,000 acres, situated in Upshur, Marion, Cass and Morris counties. L. C. Luckel, of Houston, representing the company, secured options on several of the tracks of land some time ago. Tests as to the extent and quality of the different ore bodies have been conducted over a period of several months.

Heat Treating Furnaces for Automobile Parts.—The White Company, Cleveland, Ohio, manufacturer of automobiles and trucks, has placed a contract with Tate-Jones & Co., Inc., Pittsburgh, for a large double chamber furnace for heat treating automobile parts. The furnace embodies some unique features. There is no radiation or loss of heat; it is particularly massive; and is practically two furnaces built in one, either furnace being operated separately. Fuel oil will be used through the now well-known burners manufactured by these furnace builders.

The Alan Wood Iron & Steel Company has practically completed the erection of its supplementary stack known as No. 3, at Swedeland, Pa. This furnace will have a capacity of 450 to 475 tons a day. Consideration is now being given the blowing in of this furnace, and it is probable that it will become active in the latter part of the month. Much depends on the assurance of a satisfactory supply of coke. The product of this furnace will be used at the steel plant at Ivy Rock, hot metal being transported from the furnace to the steel works, located on the opposite side of the Schuylkill River. From present indications No. 2 furnace, now in blast, will continue in operation.

The Bessemer and open hearth works of the Republic Iron & Steel Company at Youngstown, Ohio, produced a total of 89,448 tons of ingots in March.

The Prevention of Accidents in Foundries*

What Has Been Accomplished by the Methods of the American Steel Foundries—Marked Reduction in Injuries and Expense

BY W. H. CAMERON†

We are told that 30,000 to 35,000 wage earners die from work accidents in the United States every year. In addition to these fatalities approximately 2,000,000 men are seriously injured. It would be difficult to imagine the amount of suffering and distress these accidents bring upon the sufferers and the families dependent upon them. But the economic aspect of this subject is interesting, too. This tremendous array of casualties in a recent year cost $22,000,000 in employers' liability insurance premiums alone. This is the cost to the employer of protection. But it has been estimated that not more than 25 per cent. of the insurance premiums reach the sufferers from accident. We are, therefore, face to face with the question of how to prevent accidents and reduce the suffering and deprivation which these losses entail upon the workmen and their employers, as well as upon society as a whole.

Accidents Largely Due to Carelessness and Negligence

All accidents due to negligence are largely preventable. The means of prevention lie in the direction of (1) proper design and construction of plant and appliances, (2) care on the part of employers and employees, and (3) the use of safety devices. It must not be overlooked that in the past employers have concentrated their attention on the machinery and equipment of their plants and overlooked the most important element of all, the care of the human machine. Although considerable stress will be laid in this paper upon the proper design and installation of protective devices, it is believed that at least two-thirds of the accidents which happen in any plant are due to carelessness on the part of the worker and negligence for which the employer and employee are responsible.

It is an easy matter nowadays to secure information from the current journals of the details of organization for carrying out elaborate plans for safeguarding employees, involving the expenditure of large sums of money; but while it is believed that the underlying principles of both large and small organizations are essentially the same, it is the intention of this paper to give the experience of one of the smaller corporations in its efforts to prevent accidents and protect its workmen to the maximum.

First Steps in the American Steel Foundries Plan

Up to 17 months ago the American Steel Foundries followed the usual custom of protecting itself from money losses due to accidents under employers' liability policies. Investigations were made several times with a view to ascertaining the probable cost and risk of carrying its own insurance; but on account of the hazardous character of its work, the insurance was continued until it came to the realization of the economies of safeguarding. It then became apparent that the company could control to some extent at least the frequency of accidents among its employees and this assumption has been borne out by actual experiences. As in other pioneer work, the simplest method was first followed. A general inspection was made of the equipment and buildings at the plants, and recommendations were made for the protection of the most dangerous places. When these recommendations were approved the master mechanics at each plant were asked by the managers to supervise the making and installation of the guards, and to report monthly the necessity, if any, for additional guards. This method was only partly successful. The master mechanics were busy men and more or less calloused by frequent contact with carelessness and indifference on the part of the workmen. As will be shown later, the initial efforts to protect the men were not received kindly, and it seemed futile to foist upon them what they looked upon as handicaps in their work.

Committees of Workmen and Foremen

The next step in furtherance of the safety work was the appointing of workingmen's and foremen's committees. Three men were selected from three different departments of the plant and instructed to make four whole-day inspections during the month. Men were selected who were not only old employees and familiar with all parts of the plant, but who were known to be conscientious and not afraid to report what they saw. These men were carefully instructed in their work and informed that the company did not obligate itself to accept any of the suggestions or do any work. They were paid full wages while engaged on their inspection duties and $5 each upon presentation of their reports at the end of the month.

These workingmen's committees revealed the immense possibilities at each plant for protection. We received during the first month in all about 1000 suggestions, and at two of the larger plants approximately 300 each. These recommendations were described carefully in writing, numbered numerically and submitted to the three foremen in charge of the departments from which the men were selected, and they acted as a jury in approving or disapproving the suggestions made. The jury of foremen visited and inspected all of the dangerous conditions pointed out by the workingmen's committee, so as to be in a position to say "Yes" or "No" to the recommendations. Only a small percentage of the suggestions were rejected as impracticable. The combined report of the workingmen's and foremen's committees were then submitted to the plant managers, and they expressed their opinion of the reports. The result of the careful consideration of each recommendation from three different standpoints was a warranty to the officials of the company that the final recommendations were probably worthy of acceptance. These committees were continued during the following month and with about the same results. They were then discontinued for the reason that each plant had so much work to do that it seemed impracticable to pursue the subject further until the recommendations already made had been carried out. Since then, however, similar workingmen's committees have been appointed, with continued good results, and it is believed that the workmen in the plants, familiar with every working condition and having the interest of self-protection in view, can be as productive as any other agency in calling attention to the hazards of the industry. By changing the committees monthly the attention of a number of workmen will in time be especially directed to the subject of safety, and this nucleus will help to leaven the lump of the disinterested mass of workers.

Safety Inspectors

The next thing was to find a means of following up the work economically, and at four plants, employing approximately 1500, 900, 700 and 500 workmen, safety inspectors have been engaged to devote all of their time and efforts to safety, including the inspection of machinery or equipment for broken or worn out parts, the continued use of which may cause an accident, such as flask trunnions and flanges; the inspection of buildings for loose bricks; inspection of pillars; of boards and loose material stored overhead; cranes and crane runways for loose parts; the use of gongs on cranes; improper riding of workmen on loads being carried by cranes. They are also to be on the lookout for slippery places on floors and stairways, for holes, broken boards and protruding nails in boards; to make regular inspections of railroad tracks for guards at frogs and switches,

*A paper read before the Pittsburgh Foundrymen's Association, April 1, 1912.

†Manager Casualty Department, American Steel Foundries, Chicago.

holes about tracks, piling of material too close to tracks and riding on engines and cars without permission, and also to inspect hoisting cables for broken strands and rust. They are to oversee the use of scaffolding for painting or making other repairs, the use of Congress shoes by foundrymen, and to be on the lookout for loose sleeves while operating machinery; to inspect for the proper and constant use of safeguards; to report narrow escapes from injury, and the causes therefor, and to recommend discipline for workmen or recommendations for additional protection, as well as to report all other conditions about the plant which might be considered hazardous and likely to result in injury to workmen or damage to the company's property. These inspectors are required to attend all meetings of foremen, to call attention to unsafe conditions about the plant, and to suggest improvements in the method of handling the work from a safety standpoint.

Responsibility of Superintendents and Foremen

Reports of serious accidents and the causes therefor are also discussed at the meetings of the foremen and the heads of departments. It is exceedingly important to bring constantly to the minds of foremen the necessity for caution and care in the habits of the workmen. The burden of stimulating the foremen and heads of departments rests almost entirely upon the management of the plant. The managers' and foremen's attitude toward the prevention of accidents will be reflected by the workmen just as accurately as their attitude toward the production of castings is reflected. If the manager treats the subject lightly, his assistants will look upon it in the same way. If he shows a determined desire to avoid accidents, and have the rules of the plant obeyed, if he makes prevention of accidents one of the most important features of his department, then the foremen will reflect his attitude toward the work, and will see that the men take the precautions which are known to be necessary for the prevention of accidents.

How the Work Is Organized

The result of the committees' investigations were forwarded to the central office of the company and all the plants have received the benefit of all the recommendations made. The central office keeps in constant touch with the inspectors on safety matters and when an accident occurs showing carelessness or unnecessary risks taken, or where the use of a safeguard would have avoided the accident, a sketch and a safety bulletin are sent to all of the plants, with recommendations as to the avoidance of similar accidents. The central department also has charge of the care and compensation of all injured employees under a voluntary relief plan; receives full reports of all accidents, and when it is apparent that repetition of such accidents can be avoided by cautionary measures, recommendations are made to all of the plants, so that each one receives the benefit of the experience of the other.

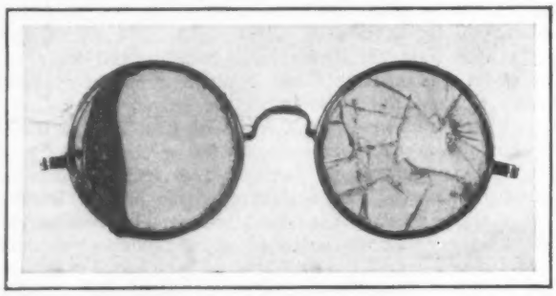
The organization of the safety work therefore has been conducted through the efforts of committees at each plant, a supervising safety inspector, and the general dissemination of the experience of all plants through a central office. For the smaller collective groups of plants, this plan will be found effective and inexpensive. The safety inspector in a plant employing from 500 to 600 workmen will have ample time to attend to the full investigation of all accidents and the preparation of all reports, as well as to the visitation of injured workmen, and to represent to them the interest of the company in their welfare and speedy recovery. He also can assist the company in reporting workmen who are inclined to magnify their injuries and make fictitious claims against their employers. We believe that these inspectors need not necessarily be experienced men in safety work. Suggestions and photographs of practical safeguards have been distributed so widely and liberally during the past year or two by such corporations as the United States Steel Corporation and the International Harvester Company, and by the American Museum of Safety and others that a fairly intelligent young man can soon apply the data at his command to the conditions in the particular plant he represents.

My further remarks will be confined largely to the work which has already been done by the American Steel Foundries for the prevention of accidents at its several plants. It is obvious that the industrial plant that can seriously follow up a plan of accident prevention must undertake (1) to provide and maintain proper working conditions and efficient safeguards, and (2) to educate its employees and inculcate in them habits of caution.

Spectacles Prevent Much Injury

Probably 75 per cent. of the accidents in steel foundries affect the eyes of workmen. It became apparent at the start therefore that it was necessary to provide all grinders, chippers, floggers, sand blasters, machinists, ladlemen and others with eye protectors which would be suitable and comfortable and not impede the work or injure the eyes of the workmen. An investigation of the use of spectacles and goggles in other industries showed that not one had been entirely successful in educating the workmen in the use of any style of spectacles. It was found, however, that the old-fashioned type of grandfather's glasses has successfully protected the eyes of men working at emery wheels; and with these glasses as a foundation to build on, the spectacles now in use are worn by about 98 per cent of the employees mentioned. The present design of spectacle is equipped with mesh screens at the sides and heavy lenses. The total weight is about one ounce per pair. A case is provided with each pair of spectacles, as well as a specially prepared cloth and paraffine pencil, used by automobilists to keep their glasses free from moisture and dirt.

The next problem was to have the glasses worn by such workmen as chippers and floggers—the majority of



Spectacles Worn by an Employee on the Flogging Floor of the American Steel Foundries, Alliance, Ohio. A chip of steel from a casting destroyed the left lens, as shown, without injuring the employee's eye. The spectacle probably saved the man the loss of an eye.

whom are foreigners—and it was found that these men would not voluntarily use the spectacles. An effort was then made by one of the plants to have the spectacles worn under the supervision of a watchman, who had time to circulate constantly among these workmen, and stimulate them in the use of the spectacles. Since the employment of safety inspectors this duty has been delegated to them. As an additional stimulus to wear the spectacles, every cleaning room workman was asked to sign a contract with the company under the terms of which he agreed to wear the spectacles constantly, and in the event of injury to his eyes happening while at work without spectacles the company is absolutely free from responsibility for the accident. When spectacles have been broken by flying chips, photographs have been made of them and posted on the bulletin boards about the plants to illustrate the hazardous nature of the work. It is believed that supervision and education along the lines described will have to be adopted in all foundries employing a large number of chippers and floggers, for the reason that these men will not protect themselves voluntarily, and the foremen and their assistants are usually too busy to give special attention to the use of the spectacles.

I have brought with me a collection of 78 pairs of spectacles, the lenses of which have been damaged by flying chips over a period of less than three months. Fifteen pairs of these spectacles were received from one plant in one month. Only one eye has been lost in all of the plants of the American Steel Foundries over the period of 17 months by workmen using these spectacles. In this one instance the piece of steel penetrated the lens with great velocity and entered the eye of the workman. If the spec-

tacles had not been worn we believe that a much more serious accident would have resulted.

Protection to Chippers and Grinders

Another means adopted by our company to protect workmen while cleaning castings is to provide screens made of canvas, mounted on supports, to be placed between the men as they work. The screens have been effective in preventing flying chips from striking fellow workmen, but they are not as complete protection to the individual workman as the use of spectacles.

We require also emery wheels over 8 in. in diameter to have a safety taper of ¾ in. to the foot, and be protected with safety collars. This means that the wheels will be convex in shape, while the collars will be concave, and should the wheel break in service, it being thicker at the hub than at the face, the pieces will be held in place. All emery wheels are also protected with cast steel hoods with plates bolted at one side, and the emery wheels used by the workmen grinding tools are provided with plate glass shields to protect the eyes. Care is also taken to keep tool rests closely adjusted to the wheels, so that castings cannot be jammed between the wheels and rests.

Emery wheels often break through mistakes made by repairmen in not changing the speed limits when placing new wheels on spindles. Our safety inspectors are required to test the r.p.m. of all emery wheels once per week and check up the speed limits. Wheels are often run at speeds far too great for their diameters.

The belts and pulleys of all emery wheels are also protected by metal guards.

Sand blasters are protected with helmets and respirators, and arc welders with aluminum helmets and rubber aprons covered with asbestos.

Accidents occur in all foundries by feet being burned by slopping metal. It is very important that workmen wear whole shoes, and that these be so constructed that they may be slipped off quickly. We urge upon our workmen the necessity for wearing Congress shoes, and we have undertaken to keep a stock of such shoes on hand at all plants, which are sold to the workmen at wholesale prices. The result is that the workman buys the shoes and protects himself from accident, and the company benefits from keeping the workman constantly at his job and by a reduction of the accident expense account.

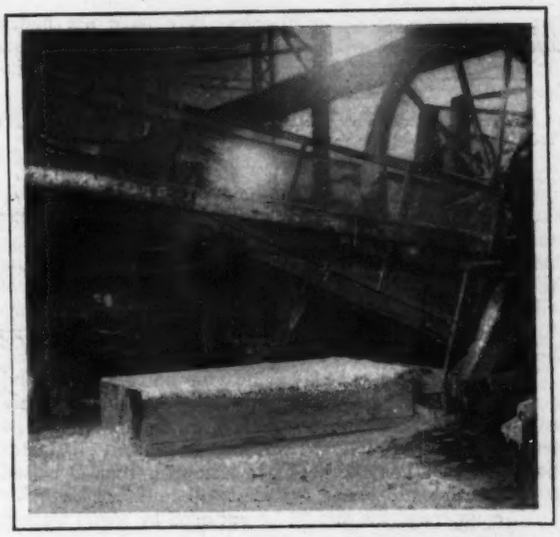
Crane Safeguarding

All overhead cranes should be provided with walks on both bridge girders, extending the entire length of the crane. Each crane should be provided with a safety switch installed on the bridge, which will cut off all power, making it impossible for an absent-minded operator to forget that men are working above and start the machinery from the cab. Each crane should also be equipped with guards extending out from the truck wheels, the purpose being to warn any person who may be resting his hand on the runway of the approach of the crane, which he might fail to notice because of other noises. A number of accidents happen every year to persons working on scaffolds on crane runways. A workman may rest his arm or leg thoughtlessly against the runway and fail to notice the approach of the crane and be run over, with the loss of one arm or leg.

All trolley gears and truck drive gears should be guarded. The floor should be completely covered in so that loose parts will not fall through the openings in the bridge girders of the trolley carriage. This is important both from a safety standpoint and from an operative point of view.

Cables and chains should be inspected regularly. The exposure of crane chains to the prolonged action of the radiant heat of metal in the ladle seems to cause a molecular change in the metal of the links. It is not safe to call this a crystallization; but such broken chain links always show a short and lustrous fracture which is called crystalline, whether it is really so or not. Frequent inspection, annealing and renewals after a certain period of time are the only safeguards against this.

Every crane should be equipped with a foot gong. When these gongs were first suggested, objection was made that the gongs would not be heard above the other noises in the foundry; but experiment soon proved the value of the warning and all cranes have since been



Guard on Sand Mill Belt Drive at Granite City (Ill.) Works, American Steel Foundries.

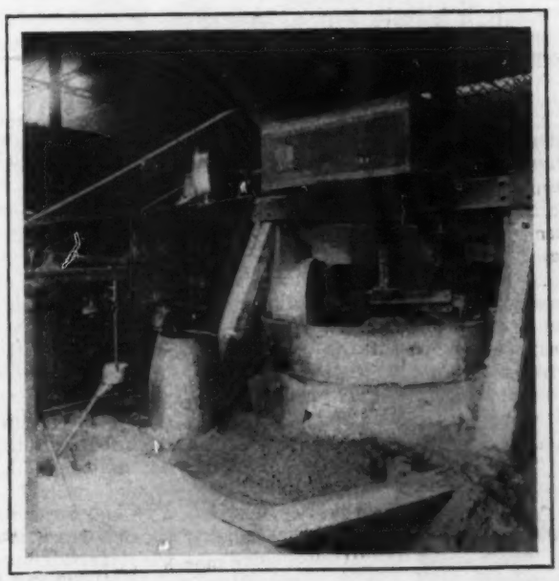
equipped with gongs. These gongs are also guarded by wire nets to prevent the gongs from falling on the heads of workmen, should they become disconnected or break in pieces. Of course, as a general part of the equipment of cranes, foot brakes should be provided, as well as boxes for oil cans and tools, so that the latter will not be laid around carelessly, and fall on the heads of workmen.

Steel ladders should be provided to enable cranemen to reach their cranes safely. These ladders should be made of angle iron, not pipe.

Pattern Shops

Band saws should have a hinged guard covering the top and front of the saw to prevent the saw flying should it break, and a head guard extending down from the saw to prevent the workman's head from accidentally coming in contact with the saw. The saw below the table should be encased. We are now trying out a wooden guard, designed in one of our pattern shops, which we expect to prove satisfactory. We also believe that all pulleys and belts in the pattern shop should be guarded, if there be any danger of timbers being caught in them.

It is also important that the knives of wood jointers be guarded. We have adopted an aluminum guard for this purpose, and it has been found to be satisfactory in every way. It is equipped with a strong spring to keep the guard constantly in position. We have equipped all of our planers with safety cylinders, which, instead of pulling the man's hand into the knives, throws it out from the machine, and instead of losing his fingers or his hand he sus-



Guard over Gears on Sand Mill, Also Portion of Belt Drive Guard.

tains comparatively slight injuries. We have not had a report of a serious injury to pattern shop workmen from the use of the planers since the adoption of safety cylinders and the use of the guard referred to.

Rubber matting in front of all pattern shop machines is recommended.

Machine Shop

All gears and pulleys should be encased in metal guards. The standard requirements for gear guards is that the gears shall be covered on the side as well as on the face; that the guards shall cover the gears to such an extent that the danger of being caught between the end of the guard and the cog of the wheel will be eliminated; and openings should be made, with sliding covers, to enable oilers to do their work.

There is a danger of having the limbs caught and sheared off between the table and the ribs of the planer bed. Workmen, contrary to all rules, ride on the tables of these machines, and a guard placed over the bed eliminates this danger. When the beds are left open they are used frequently as a receptacle for tools, oil cans, etc.

All counterweights should be enclosed by metal guards with door openings, so that the weights can be easily removed should they fall, without detaching the entire guard.

Switch box doors should be equipped with latches and repairmen and others supplies with locks, so that workmen can protect themselves by locking up switches to avoid the danger of machinery being started while repair or other work is being done upon it.

Power Plant

The ends of piston rods extending beyond the cylinder heads should be guarded, the purpose of the shield being to prevent the men getting so close to the cylinder that they will be struck by the rod.

All flywheels should be guarded either with plate or wire net guards. All points on engine beds where oilers may have occasion to walk should be provided with screen or plate guards to a height of five feet from the pillar blocks.

There will be an opportunity in almost all foundries to apply protection to such machines as charging cars, where it is found necessary to provide guards for the truck wheels. Where a railroad track runs close to a building, railings should be placed at the corner of the buildings to prevent men suddenly stepping from the buildings onto the tracks.

Considerations of economy often lead to the overcrowding of machinery; i. e., too many machines are placed in a given space. The width of the passageways between the machines is thus reduced to the point of danger. Any undue curtailment of space interferes with the proper handling of the machines and adds to the risk and probability of accident, owing to the operator being exposed to contact with gears, pulleys, belts and other moving parts, or even where guards are provided in fullest measure it is really impossible to eliminate absolutely all danger. The space should not be held of more value than safety.

General Suggestions

Cleanliness about the shop and yards cannot be too strongly urged, as there is no question as to its being a factor in causing men to be more cleanly about their work, and in preventing accidents due to untidy conditions. It is also true that shop windows should be cleaned at regular intervals, and illumination generally may be greatly improved by whitewashing the walls of a dark room at least once a year. This also saves much on the cost of artificial illumination. Mention may be made of the risk of permitting unsuitable clothing to be worn. Leather leggings for the use of belt repairers will minimize the risk of accident, as there is considerable danger of these workmen having their trouser legs caught in moving machinery. Gasoline should not be carried in open cans. This is frequently done by careless workmen, but it is the avoidance of such accidents as these that assists in the improvement of the accident record.

I suppose there is no one who has ever had anything to do with the operation of a foundry who has not heard of the danger in protruding set-screws. Nevertheless these will be found in every plant, and they should be countersunk to make the working conditions safe. Slippery floors are also a menace to unsuspecting workmen, and, if necessary, rubber matting should be provided to prevent accidents.

The insistence on rules and regulations is emphasized by all persons having anything to do with the prevention of accidents, but we believe that these should be used sparingly and be as brief as possible. They may give legal protection in damage suits for accidents, but they are practically worthless if no attempt is made to enforce them. We believe that a few effective rules insisted upon by educated foremen, in sympathy with the full protection of their workmen, will be far more effective that a long list of works rules which few will read and none will remember.

We believe that money and effort expended for the protection of workmen in foundries will be amply returned in the form of a better and more stable organization, and an actual saving in the accident expense account.

New Tools and Appliances

This is essentially a news department for which information is invited.

Clutches.—Several new types of clutches are being developed by the Bicknell-Thomas Company, Greenfield, Mass. These include one style which is designed for line shafting and will permit the machine to be belted directly to this shaft without the employment of a countershaft, a pulley type for both line and countershafting and a clutch pulley for use on electric motors. Some of the special features of all these clutches are a rolling frictional grip, a minimum number of parts and an automatic adjustment for wear. The pulley for electric motors is said to be very compact and occupies only the same amount of space as the regular belt pulley.

Crane Controller.—The Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., has brought out an improved grindstone type of controller for use in connection with direct-current motors operating cranes, hoists, steel mill machinery, etc. This controller consists essentially of a cast-iron frame, on which is mounted a stationary concrete disk carrying the contact pieces and the cross connections. A switch arm with four brush-holders is pivoted to the center of the disk, and the resistors can be mounted on the frame or separately. The concrete used for this disk is specially treated, so that it is made a thorough non-conductor and at the same time is moisture resisting. Using concrete in this way enables the cross connections between the segments to be made within the body of the disk, which gives a reinforced concrete construction and at the same time produces a compact piece of apparatus. The contact pieces are attached to the disk by screws, as in the older type of controller, and are easily renewable, while a blowout coil wound with asbestos insulated wire is mounted on each brush-holder to disrupt the arc produced when the circuit is opened.

Heel and Calking Machine—The Butts & Ordway Company, 33 Purchase street, Boston, Mass., has placed on the market a heel and calking machine for forming the calks on horse shoes. In operation the machine is very simple and by placing the shoe on the bending levers and bearing down on the handle a square calk is formed which is free from a cold shut and can be of any desired size. One heat is sufficient to weld either a sharp or a blunt calk by the dropping of the handle and the heel is muled by the same pressure. One of the special advantages claimed for this machine is that all heavy blows and pounding are eliminated.

Multiple Spindle Boring Machine.—A five-spindle cylinder boring machine which is especially designed for airbrake cylinder work has been recently brought out by the Newton Machine Tool Works, Inc., Twenty-fourth and Vine streets, Philadelphia, Pa. It consists of a cross rail having in-and-out adjustment on two uprights, one of which is also adjustable. Mounted upon the cross rail are two spindles each of which have cross and vertical adjustments and vertical feed. Three of the spindles are vertical, two being mounted on the right-hand saddle and operating in unison, while the other two are horizontal and are supported in the saddles. These last two spindles have vertical and horizontal adjustments and a cross feed.

Julian Kennedy Before the Stanley Committee

The Famous Mechanical Engineer Called Before the Committee to Give Testimony in Regard to a Wide Range of Subjects, From Railroading to Tariff Making

The Committee on Investigation of the United States Steel Corporation, of which Congressman Augustus O. Stanley is chairman, called before it Julian Kennedy, of Pittsburgh, who occupied a large part of March 27 and 28 in answering the questions of the members of the committee. Extracts from his testimony are here presented:

THE CHAIRMAN. Did you design and construct any of the blast furnaces now owned and operated by the United States Steel Corporation?

MR. KENNEDY. Yes; some at Braddock, the Edgar Thomson works; some at Denora and some of the Ohio works at Youngstown. I have also consulted and advised on many other plants which now belong to the Steel Corporation in connection with the construction.

THE CHAIRMAN. Did you construct any steel furnaces for the Steel Corporation?

MR. KENNEDY. I constructed some at the Homestead works when I was manager there; also the Bessemer plant at the Ohio works for the Ohio Steel Company.

THE CHAIRMAN. You spoke of being manager there. That is manager for the Carnegie Steel Company?

MR. KENNEDY. For Carnegie, Phipps & Co.

THE CHAIRMAN. How long did you occupy that position?

MR. KENNEDY. Three years at Homestead.

Influence of Capacity of Works

THE CHAIRMAN. Roughly speaking, what was the capacity of these blast furnaces which you constructed?

MR. KENNEDY. Four hundred to 500 tons per furnace. I do not remember the number now. It has gotten beyond me.

THE CHAIRMAN. Do you know the capacity of the rolling mills?

MR. KENNEDY. No, I do not. I have not paid much attention to that of late.

THE CHAIRMAN. Is there any economy, Mr. Kennedy, in operating these large plants, like a blast furnace, to their total capacity, and how is that with reference to a rolling mill?

MR. KENNEDY. In a general way, yes, to the reasonably full capacity. In crowding a plant to its utmost capacity sometimes the cost runs up a little.

THE CHAIRMAN. What is the effect of an excess of unused capacity in normal times?

MR. KENNEDY. I do not know that I understand exactly what you mean.

THE CHAIRMAN. I mean economically considered, to have a mill run about 60 per cent. of its full capacity, is it economical?

MR. KENNEDY. I should say a mill running 60 to 80 per cent. of its capacity would be fairly economical, not quite as economical as its full capacity, but to take care of fluctuating demands it would be undoubtedly wise to have a little more capacity than required under the average normal conditions.

THE CHAIRMAN. There has been a great deal of testimony here about fluctuations in the prices of steel products. Under a heavy demand the prices go up, and in dull times the prices go down; and as Mr. Carnegie said, the steel man is either a prince or a pauper. It has been claimed that it is necessary to enter into agreements touching prices or to have some understanding touching prices in order that there may be stability in the prices of steel products. Do you know of any other cause or any other remedy for this variation and fluctuation in prices than the fixing of prices by those contracts?

A Tariff Can Be Too High

MR. KENNEDY. I have felt for many years that the extreme fluctuations, such as those spoken of by Mr. Carnegie, which were more pronounced 14 or 15 years ago than they are today, were caused largely by having too high a tariff on some articles. I remember that about the year 1898 or 1899 the industry in wrought iron or wrought steel tubing was in very bad condition. Competition had brought it to a state where they were all very much discouraged and where they got together to form a combination of all the people to try to get some profit out of it. My own opinion is that that was largely caused by the placing of a tariff too high on pipe, the tariff at that time being $40 per ton. I think a more moderate tariff would have allowed some foreign goods to come in to stop extreme demands and would have steadied the market and prevented an overbuilding of works all over the country.

THE CHAIRMAN. Explain how a lower duty on these various products would tend to equalize those prices.

MR. KENNEDY. A lower duty at that time, I think, would have allowed some material to have been brought in from abroad when prices ran away, so to speak, and would have steadied the market. On the other hand, when the tariff is put so very high that nothing at all can come in from abroad, a sudden expansion of demand puts the prices up to an exorbitant figure, an abnormally high figure, and then a lot of people build works as rapidly as possible to get some of that fancy profit, which then sends prices away down into the valley again, where none of them make any profit, and there comes a bitter competition.

THE CHAIRMAN. Speaking of this building of plants for any purpose until you have an excess of production over a normal demand, I find that the production given by Herbert Knox Smith, in his report at page 363, of pig iron, for instance, by the Steel Corporation in 1910, was 11,000,000 tons. Its capacity for the year ending July 1, 1911, was 16,000,000 tons. What is the effect of this potential capacity upon competition, outside of its effect on economical operations? For instance, if the Steel Corporation runs at full capacity, it could supply 80 per cent. of all the pig iron used in this country. Has that any moral effect upon other persons not in the Steel Corporation, but engaged in the production of pig iron?

MR. KENNEDY. Yes, I think it would make other persons a little cautious about antagonizing the Steel Corporation needlessly.

MR. REED. The same figures show that if the independents ran at full capacity they could supply more than 100 per cent. of the country's consumption of pig iron. Will you ask Mr. Kennedy what effect that would have?

THE CHAIRMAN. What effect would that have on the Steel Corporation?

MR. KENNEDY. None at all, I think. (Laughter.)

THE CHAIRMAN. You started to explain something about the tariff on tubes and I interrupted you.

MR. KENNEDY. The tariff on tubes was $40 per ton, which was practically a Chinese wall, and the tube people were small in numbers for a while and their profits got abnormal and very fancy, and a great many other people jumped into the tube business. It is a business that is not necessarily very highly organized, and men could get in quickly, and with a small amount of capital, if necessary, so a great many tube plants started. Some of them were small, but all were active, and we got an overproduction, and business became very much demoralized, as I noticed. I had occasion to go around all the tube plants about that time and examine them.

THE CHAIRMAN. Explain what that occasion was.

The Tube Consolidation

MR. KENNEDY. The tube people wanted to get together, as I understand it, with a view to ending this condition of affairs, and they entered into negotiations with J. P. Morgan & Co. of New York to combine them into a larger company, and I was——

MR. BARTLETT. When was that—1899?

MR. KENNEDY. About that time, I think; 1898 or 1899. I cannot fix it exactly. It was just prior to the formation of the National Tube Company, whenever that was. I visited all the works and talked with all the people and found them very much discouraged. The competition was getting wild at that time, and it was in such a shape that no one could blame them for wishing to get out. Nobody was making any money, and they were being chiseled very hard by purchasing agents. Contracts were being made for a year's requirements, and if prices went up the requirements were large, and if prices went down the requirements were small. Generally it was a buyer's market, as we call it, and the tube people were very much in the blues.

MR. BARTLETT. That overbuilding of plants and overproduction was due to the stimulation of business by the high protective tariff, you think?

MR. KENNEDY. Yes, I think if the tariff had been about the natural difference in cost between pipe here and abroad there would not have been nearly so many plants built.

MR. BARTLETT. Do you know whether during that time foreign prices went up? Do you know what the foreign market was and the prices in the foreign market for American-produced tubes during that time?

MR. KENNEDY. No, I do not know exactly, but the price for tubes in this country was very low and there could not have been much difference between it and the foreign market.

MR. BARTLETT. Then where the tariff is so high as to be prohibitive and thus increases and stimulates production of the product protected, the tendency is to increase the desire to combine among the producers of the product protected?

MR. KENNEDY. Yes; if the tariff is so high that nothing can come in, we are liable to have alternately extremely high prices and extremely low prices, and during the periods of very high prices lots of people will start in and construct plants, especially if they are plants that can be constructed in a short time.

MR. BARTLETT. When the manufacture gets to such an extent as the result of the stimulation of the high tariff and the producers are compelled to compete to such a degree as to get the market in the condition where it is a buyer's market, they necessarily resort to the method of combining in order to control prices, do they not?

MR. KENNEDY. The tendency is that way.

MR. BARTLETT. Do you attribute that result mainly to the prohibitive tariff?

MR. KENNEDY. I did at that time.

THE CHAIRMAN. You were employed by J. P. Morgan & Co. of New York to appraise the tube works of this country?

The Valuation of the Tube Plants

MR. KENNEDY. Not to appraise, exactly.

THE CHAIRMAN. To fix a valuation?

MR. KENNEDY. The works were not bought on that valuation, but to give our opinion as to valuation as a guide to it, as I understand it.

THE CHAIRMAN. What was the valuation of the National Tube Works at that time?

MR. KENNEDY. I would rather not give that. I think Morgan & Co. undoubtedly would furnish that if asked for it.

THE CHAIRMAN. Mr. Morgan stays in Egypt or some other seaport, unfortunately for us. I do not want to press you, but was it in excess of $19,000,000?

MR. KENNEDY. I should say not.

THE CHAIRMAN. They were only capitalized for $250,000.

MR. REED. Mr. Kennedy appraised only the plants.

MR. KENNEDY. I only appraised the plants, and considered them as going plants, including the expense of starting and organization, but nothing for good will or possible effects of combination. That was distinctly left out.

THE CHAIRMAN. Explain the difference between the valuation you made and the mere physical valuation and cost of reproducing.

MR. KENNEDY. The valuation we made was a little higher, because anybody reproducing that plant would have to run it almost for a year in getting the organization perfected and the machinery adjusted, which is part of the construction cost, although not always considered that.

MR. REED. You did not include quick assets, did you?

MR. KENNEDY. No.

MR. REED. Cash or securities?

MR. KENNEDY. No.

THE CHAIRMAN. Did these plants have any ore or anything of that kind you did not appraise?

MR. KENNEDY. I think not. We did not consider that, anyway.

THE CHAIRMAN. Mr. Herbert Knox Smith's report puts it at $14,000,000.

MR. REED. It is anybody's guess.

THE CHAIRMAN. Do you know what per cent. of the tube business was included in this organization, approximately?

MR. KENNEDY. I do not know exactly, but it was nearly all. There were one or two works that did not conclude to come in. The Spang-Chalfant works is one that I remember now.

MR. REED. How about the Byers?

MR. KENNEDY. That is not included.

MR. REED. About 75 per cent., wasn't it?

MR. KENNEDY. I should have said 90 per cent., but I would not be positive.

MR. BEALL. Was the effort made to get all of them in?

MR. KENNEDY. The Spang-Chalfant plant was considered, and I think possibly the Byers. I do not know that there was any great effort. I think the prices were not quite satisfactory, and some of them were omitted.

MR. BARTLETT. Did they do a good business afterward?

MR. KENNEDY. Yes, very good.

[Here much questioning occurred regarding various bridge plants and the absorption by the Steel Corporation of the Union and Sharon steel companies, without eliciting much new information.]

The Tennessee Company

THE CHAIRMAN. What would you say, taking these two as a basis, the Union-Sharon and the Tennessee Coal & Iron companies, as to the value of one property compared with the other?

MR. KENNEDY. I would consider the Tennessee very much more valuable than the other per se.

THE CHAIRMAN. I will ask you to explain that to the committee.

MR. KENNEDY. I do not know exactly how much cheaper the Tennessee Coal & Iron Company can produce iron than the Northern furnaces, but I would say in round numbers about $2 per ton. I should also say it could produce rails at least as cheaply as the Northern company. This being the case, it commanded a very much larger territory, due to location, and had great potentialities that I think developed into a much larger thing than the Union-Sharon Company's, other things being equal.

THE CHAIRMAN. Had the Sharon any rail mills?

MR. KENNEDY. No.

THE CHAIRMAN. Had the Tennessee Coal & Iron Company any rail mills?

MR. KENNEDY. Yes.

THE CHAIRMAN. Are you acquainted with the extent of the ore holdings and coal holdings of the Tennessee Coal & Iron Company?

MR. KENNEDY. I have known them, but I have not them in mind at the present time. I know they are very large.

MR. YOUNG. Do you mean you never examined this district yourself?

MR. KENNEDY. Yes, I have been along the ore; and I have been also in several coal mines, but of course that gives very little idea of the acreage. A great deal of it is undeveloped yet.

THE CHAIRMAN. Assuming that ores in the Birmingham district are controlled practically entirely by the Woodward Iron Works and the Sloss-Sheffield people and the Republic Iron & Steel Company, outside of the Tennessee Coal & Iron Company; and the Tennessee Coal & Iron Company had a greater amount of these raw materials, and that its acquisition eliminated those fields from the possibility of furnishing merchantable ores in great quantities to the market, and placing its ore holdings at 700,000,000 tons, and its coal at 1,000,000,000 tons, and taking what you know of its plants at the time they were absorbed, what would you say was the value of that property?

MR. REED. Does not that question contain quite a lot of rather violent assumptions?

THE CHAIRMAN. No, the record is filled with the figures as given. Of course if my assumptions are not correct the answer will be of no consequence.

MR. YOUNG. I think there are none of the papers that have the opinions of engineers as to the amount of that ore, except our own. Another suggestion I would like to make is that there is nothing stated about whether the 700,000,000 tons of ore is merchantable or unmerchantable. It is well known to everybody there is a large amount of ore in Birmingham that is at present unmerchantable.

THE CHAIRMAN. I understand that, but I am framing my question.

MR. KENNEDY. I should say it was worth $100,000,000 at the least.

MR. BARTLETT. For what?

MR. KENNEDY. The plant based on 700,000,000 tons of ore and 1,000,000,000 tons of coal.

THE CHAIRMAN. Taking the statement of Herbert Knox Smith, would you change that estimate materially?

MR. KENNEDY. I should probably reduce it a little, say to $90,000,000, on that supposition.

THE CHAIRMAN. What supposition is that?

MR. KENNEDY. That there are 400,000,000 tons of ore, 1,000,000,000 tons of coal, which I take to be about the gist of the last assumption of Herbert Knox Smith's statement. Whether there are 400,000,000 tons of it or 700,000,000 tons matters very little for the purpose of valuation, provided they get substantially all in the district, so that no competitor of any size comes in and starts any opposition.

MR. REED. That is part of your assumption in the valuation?

MR. KENNEDY. Yes, that it gets a large part of the coal down there and of the ore.

MR. REED. A monopoly?

MR. KENNEDY. A practical monopoly, yes.

Foreign Costs of Production

THE CHAIRMAN. Have you ever conducted a blast furnace in India or China?

MR. KENNEDY. In India, but not in China.

THE CHAIRMAN. In Russia?

MR. KENNEDY. Yes.

THE CHAIRMAN. What is the cost of producing pig iron, if you know, in India, as compared with the cost in this country?

MR. KENNEDY. It is a little early to state yet with exactness, but probably about the same as in the Birmingham district.

THE CHAIRMAN. What is the labor cost of producing pig iron in India as compared with the labor cost of producing it in this country?

MR. KENNEDY. At the present time, about the same; possibly a little higher in India owing to importing some men and paying their traveling expenses.

THE CHAIRMAN. It has been stated repeatedly you can employ men in India for five or ten cents a day, and in China the same, and that there is danger of having this country invaded by Chinese pig iron.

MR. KENNEDY. We get a little Chinese pig iron on the Pacific coast now.

THE CHAIRMAN. How about India?

MR. KENNEDY. In India the growth will not be very big, as the collieries are limited there. It is not likely the industry will ever grow to very large proportions there.

MR. DANFORTH. What is the cost of producing pig iron in Russia as compared with this country?

MR. KENNEDY. I have never followed that up.

THE CHAIRMAN. What is the labor cost in a ton of pig iron in this country?

MR. KENNEDY. In the modern furnace, what is known as producing labor, the labor at the furnace, runs from 40 to 60 cents a ton.

THE CHAIRMAN. What is the cost of producing a ton of pig iron after your materials are assembled at the furnace, in a well organized plant?

MR. KENNEDY. From $1 to $2 per ton.

MR. BARTLETT. What do you find to be the labor cost in India?

MR. KENNEDY. The labor cost in India, when they get both furnaces running, will be about 78 cents a ton; but those are smaller furnaces, and furnaces of that same size in this country will run that high, I would say.

MR. BARTLETT. If it costs as much to produce a ton of pig iron in India or China or Japan, there is not much danger of their competing here with the producers of pig iron successfully, is there, paying the freight?

MR. KENNEDY. I should think the Chinese people might send their product to the Pacific coast. I see no reason why they should not. It costs $13 or $14 to take pig iron from Pittsburgh to the Pacific coast, or $12 from Chicago, which is more than the cost there to start with.

MR. BARTLETT. They have extensive pig iron mills on the Pacific coast, have they not?

MR. KENNEDY. No. We have very little in the way of iron works on the Pacific coast.

MR. BARTLETT. It is not a matter of tariff that would prevent the Chinese from competing with our manufacturers of pig iron, but it is a matter of freight rates and transportation; is that it?

MR. KENNEDY. Largely, I should say, yes.

Ownership of Railroads by Industrials

THE CHAIRMAN. There has been a great deal of discussion lately, not only before this committee, but by the Interstate Commerce Commission in its decisions and in its last report, as to the propriety of having industrials control and operate common carriers. Is a railroad an essential or a necessary part—I mean a railroad acting as a common carrier, a railroad assistant—of an integrated steel mill?

MR. KENNEDY. No, I should say not.

THE CHAIRMAN. Can a railroad be operated more cheaply by an industrial concern, a manufacturing concern, than by persons engaged entirely in transportation? Is there any reason why it should be, that you know of?

MR. KENNEDY. I should think not.

THE CHAIRMAN. If one industrial controls railroads, and its rivals or its competitors do not, does it give to that industrial any advantage?

MR. KENNEDY. Yes, I should say it did.

THE CHAIRMAN. I will ask you to explain to the committee why any industrial concern should not own or operate a common carrier, if you take such view of it.

MR. KENNEDY. In my opinion, a common carrier should treat everybody alike as nearly as possible, just as a post-office; and for an industrial to own a common carrier of course may result in putting it at quite a considerable advantage, as compared with other people in the same line of business who do not. It is also susceptible of being used to get more than what might be called a due proportion of freight rates.

For example, if a steel company should haul out its own ore and an equal amount for outside people, and the rate should be, for illustration, 40 cents higher than it should be, the steel company which owned the road would be receiving 40 cents extra profit on each ton of its own ore, and 40 cents profit on each ton of the outsiders' ore, which would, in round numbers, enable it to produce pig iron at about $1.60 a ton cheaper than its competitors. Of course, if the proportions were different, or the amount of excess freight were different, these figures would be correspondingly changed. These are predicated on the assumption that two tons of ore make a ton of pig iron.

THE CHAIRMAN. Now then, take the Bessemer & Lake Erie Railroad. Have you any idea what would be a fair rate for that road, from either an examination of the earnings, or your knowledge of the road, your knowledge as to the cost of transportation?

MR. REED. I should like to object to that, because Mr. Kennedy has not been shown to be an expert.

THE CHAIRMAN. But I assume Mr. Kennedy is known as having a great reputation as an engineer, and in all branches of the industry, such as to qualify him without going through a *voir dire*.

MR. REED. All right, if being a great engineer authorizes him to pass on freight rates.

MR. BARTLETT. I do not think it does. I have no doubt Mr. Kennedy will not state, if he does not know anything about it.

THE CHAIRMAN. Mr. Kennedy, do you know anything of the Bessemer & Lake Erie Road, of its earnings, the character of the road, the cost of operating it?

MR. KENNEDY. Oh, not in detail. In a general way, I do.

MR. BARTLETT. You have had experience in making that sort of inquiries?

MR. KENNEDY. Somewhat. I have had quite a little experience in arranging for freight rates in India, in connection with works there. Before the people built the works they made quite a study of the freight situation and also arranged for freight rates with the railroads, and it was my painful duty to assist them; so I gathered up a little information there.

MR. BARTLETT. In that inquiry did you also investigate and make a comparison of rates here and in India?

MR. KENNEDY. Yes. I might say that the rates in India for bringing the iron from the mines, the coal from the mines, the limestone from the quarries, and the finished product to the seaboard, are all the same; and they are three mills per ton per mile.

MR. BARTLETT. What is the rate here? How much per ton per mile?

MR. KENNEDY. It varies a little, but considerably more than that.

MR. BARTLETT. So your business has brought you into the duty of inquiring into the reasonableness of rates, as to this particular kind of business, as well as other things?

MR. KENNEDY. Somewhat; not extensively. I do not profess to be very expert on it.

MR. DANFORTH. Who owns and operates the railroads in India?

MR. KENNEDY. They are owned by corporations, and they are worked in connection with the Government also. The Government owns perhaps half of them.

MR. DANFORTH. The Government dictates the prices which they may charge, I presume?

MR. KENNEDY. The Government watches it pretty carefully. It does not allow any private roads prorating with works roads, or anything of that kind.

A Reasonable Freight Rate on Ore

MR. BARTLETT. What I wanted to get at was this, whether from your investigations you were in a position to state what would be a reasonable rate on ore.

MR. KENNEDY. Well, I don't know that my opinion would carry much weight.

MR. BARTLETT. Not as to the effect of your opinion. I want to know whether you have had enough experience, have investigated enough, to be able to say what in your opinion would be a reasonable rate for doing this kind of business.

MR. REED. I think Mr. Kennedy is more than anxious to oblige the committee, but perhaps he is giving you guesses where he does not feel the guesses are worth very much. I am willing to leave it to him.

MR. BARTLETT. Mr. Kennedy, do you or do you not think——

MR. KENNEDY. I hardly know about that. I have been vice-president of a road for six or eight years that carries considerable freight, and I have studied it there.

MR. BARTLETT. You have the data, the details, that make up the basis from which you conclude what is a reasonable rate? You are familiar with those things?

MR. KENNEDY. I know about what percentage of the gross it ought to earn, not to be greedy.

MR. BARTLETT. You know whether or not your experience and information are enough to give you the right to say what you deem to be a reasonable rate on ore.

MR. KENNEDY. I should think I would be competent to give fairly an estimate, not as good as a man on the Pennsylvania Railroad, or anything of that kind, who studied it all the time.

MR. BARTLETT. You have devoted a good deal of your time and labor to this sort of thing?

MR. KENNEDY. I have had occasion to study it some. I am unfortunately president of a coke company, which ships a good deal of ore.

MR. REED. I think Mr. Bartlett and Mr. Kennedy both misunderstood my suggestion. I did not suggest that Mr. Kennedy is not competent to express an opinion, if he knows the facts. But I do not believe the committee has given him sufficient facts with relation to the Bessemer road to warrant asking his opinion.

MR. BARTLETT. Have you read the evidence about the rates on this road, about which you are asked, the Bessemer & Lake Erie, as to what it costs to operate it, and so on?

MR. KENNEDY. Not very fully; no.

MR. BARTLETT. Now, are you able to say what the service of hauling ore on this road is worth, from what information you have about it?

MR. KENNEDY. I can give my opinion.

MR. BARTLETT. That is all you are asked to give.

MR. KENNEDY. I think it is worth about 40 cents.

MR. REED. From Conneaut to Pittsburgh?

MR. KENNEDY. Yes.

MR. DANFORTH. Let us find out a little more about that while we are on it. Mr. Kennedy is a competent witness. Let us see what he bases his opinion on. On what do you base that estimate of 40 cents, as the proper rate?

MR. KENNEDY. I base my estimate on a lot of investigations in connection with some coal rates from Pittsburgh to the Lakes, and some matters that have been up lately.

THE CHAIRMAN. Assuming that 40 cents is a fair and remunerative rate, and the road charges 96 cents; that the Steel Corporation hauls its ore over that road, and other roads charge the same rate; what would be the difference to the manufacturers of pig iron, the competitors of the Steel Corporation, on the total cost of producing a ton of pig iron, say to Pittsburgh, or the valleys?

MR. KENNEDY. With 50 per cent ore it would be $1.12 per ton of pig iron.

THE CHAIRMAN. What is a fair profit on pig iron? At what profit per ton can you manufacture pig iron and sell it?

MR. KENNEDY. Two dollars would be considered a handsome profit.

THE CHAIRMAN. You say you have been vice-president of a road, and have had experience in shipping. Do you know anything about the prices charged for shipping wheat and commodities like that, generally?

MR. KENNEDY. I think it is about three mills per ton per mile from Chicago to New York. That is my recollection.

THE CHAIRMAN. Which is the higher class freight, and which could be transported most cheaply, billets, pig iron, ore or wheat?

MR. KENNEDY. Wheat would be the higher class.

MR. BARTLETT. What is the rate per ton on pig iron or billets?

MR. KENNEDY. It varies enormously.

MR. BARTLETT. Is it greater or less than wheat?

MR. KENNEDY. That depends. I understand—this is hearsay. I suppose hearsay goes here to a certain extent.

MR. REED. Everything goes.

MR. KENNEDY. I understand a shipper of steel from Pittsburgh can go to Jersey City by going via the Steel Corporation road and then intersecting the east and west road before it gets to Conneaut, and get to Jersey City for 70 cents a ton. Mr. Reed would know more about that than I would.

MR. BARTLETT. How would that compare with three mills per ton per mile for carrying wheat?

MR. KENNEDY. I should suppose it would be under two mills per ton per mile. On the other hand, coke from Connellsville and Youngstown goes 134 miles for 135 cents. It is one cent a ton-mile plus a cent.

THE CHAIRMAN. How do you account for that difference over the same road?

Export and Import Freight Rates

MR. KENNEDY. This other is export business, and there are a great many vicious things in connection with it.

MR. BARTLETT. That is where they charge less for the long than for the short haul.

MR. KENNEDY. No; less for export business than for other business.

THE CHAIRMAN. Do you know anything about the difference between the Bessemer & Lake Erie and other railroads on export business?

MR. KENNEDY. I have been told by parties who are expert on rates that the export rates from the Pittsburgh district to Jersey City are $1.50, of which 80 cents goes to the Pittsburgh & Lake Erie and 70 cents to the trunk line which intersects it.

THE CHAIRMAN. Do you know how that compares with the domestic rate?

MR. KENNEDY. It would be very much lower than the rate from Buffalo to Jersey City on domestic pig iron or steel to be used in New York. It would certainly cost more than that.

MR. BARTLETT. What would be the reason for giving the advantage to the exporter over the man who did not export? What would be the reason for charging a less rate per ton for a shipment destined abroad than to charge what they do charge from Pittsburgh to Jersey City?

MR. KENNEDY. The reason is to aid the people in exporting material; to build up the foreign trade.

MR. BARTLETT. Take the converse of that. Is that also true as to the manner of importing materials, hauling to the interior?

MR. KENNEDY. Oh, yes; it is undoubtedly true.

MR. BARTLETT. Now the reason given for the one would not apply in the other.

MR. KENNEDY. I should say, in my opinion, a road should not be allowed to haul freight, either for import or export, for less than they haul domestic freight.

MR. BARTLETT. Does not the effect of this permitting importers to pay less rates from the port to the interior than are allowed the domestic shipper virtually interfere with the protection that the domestic manufacturer has by reason of the tariff?

MR. KENNEDY. Undoubtedly.

The Cost of Producing Steel Rails

THE CHAIRMAN. What is the cost of producing a ton of standard steel rails, say in Pittsburgh—Bessemer rails, open hearth, or both?

MR. KENNEDY. It will only be a guess on my part. I have made steel rails, but it was 20 years ago. I have been engaged more in the construction of plants. In a very general way I know if you put $7.50 on pig iron and add $12 you will get about $19.50, which would be a safe price for which you could make rails.

MR. BARTLETT. The price has kept up about the same for 20 years.

MR. KENNEDY. You will notice in your own records here the testimony of witnesses that they made good money on selling rails at about $17. And they have made them at the cheap cost of $12. I think possibly that was rather exceptional; it must have been for one month alone.

MR. BARTLETT. That was Mr. Schwab.

MR. KENNEDY. But prices would be higher now.

MR. REED. I should think they would.

MR. KENNEDY. Because costs in all lines have gone up.

MR. REED. The cost of pig iron alone would make considerable difference.

MR. BARTLETT. Is $19.50 your opinion of the present cost of producing steel rails? Does it mean the standard steel Bessemer rail?

MR. KENNEDY. The standard steel Bessemer rail I should guess at about $18 for a company like the Steel Corporation, and open hearth rails $1 or $1.50 more.

THE CHAIRMAN. How does the cost of producing rails in this country compare with the cost of producing rails in the Old World—the standard rail?

Labor Cost in Foreign Rail Mills

MR. KENNEDY. I should say the labor cost was somewhat less here per ton than there. The mills are larger and there are fewer men around them; less hand work done.

MR. BARTLETT. You mean by that that while the furnace may pay less per diem wages, in the long run the result is that the labor cost of producing a ton of rails is as great abroad as it is here?

MR. KENNEDY. I think you will find the labor cost in Germany will be as great per ton as here. The wages will be less, but I think you will find the men not doing as much in the steel mills; they are not geared up so high.

MR. BARTLETT. Do you know how the prices abroad for American manufactured steel products compare with the prices asked here?

MR. KENNEDY. I know, in a general way, they are somewhat less, although not always. Sometimes export business goes as high in price as domestic; possibly, sometimes a little above.

MR. REED. You mean the laid down price abroad averages less than the price here?

MR. KENNEDY. The price at the mill averages, as a general rule, less for export stuff than for home stuff, although not always. Sometimes under special conditions it may run even higher.

THE CHAIRMAN. Now, Mr. Kennedy, do you know of any country making rails that can import them into this country, even if we had no duty, in competition with rails made here?

MR. KENNEDY. No, except on the Pacific coast it might be possible to put them in.

THE CHAIRMAN. Would it be possible for any foreign manufacturer to produce steel rails and lay them down in this country in competition with ours? I do not mean at the present rate of $28 a ton. I mean if there was competition in rails and no tariff?

MR. KENNEDY. No, I do not think they could, except in certain portions of the country. I have no doubt that in Texas, for example, and on the Pacific coast they might.

THE CHAIRMAN. And how about in the body of the country?

MR. KENNEDY. I do not think they could put steel rails in Pennsylvania, for example.

MR DANFORTH. Down in Texas why has not the Tennessee Coal & Iron Company the advantage?

MR. KENNEDY. I expect you could ship from London for less than from Birmingham. I don't know what the freight rates are.

THE CHAIRMAN. I find from page 1770 of the hearings—I have compared these figures—that the foreign price of structural steel shapes, as furnished by the Steel Corporation in 1906, was $29.58 a ton, and that at that time the domestic price, as given by the American Iron and Steel Association, was $38.84 a ton, making a difference between the domestic and the foreign price of $8.26 per ton. To what do you attribute that difference?

MR. KENNEDY. I can only account for that by the assumption that the foreign market would not allow any higher price than that.

The Cause of Broken Rails

THE CHAIRMAN. There has been a good deal of discussion lately as to broken rails. What is the cause of it? Is it the manufacture of rails, the construction of engines, or what?

MR. KENNEDY. Anyone who has noticed railroads for the last few years must have seen that the wheel loads have come up enormously. You must also have noticed the great size of the engines, and also that the driving wheels of engines are counter-balanced on one side to balance the weight of the rods, which gives a hammer blow to the rail at every revolution of a wheel. There has also been a tendency in late years to run trains faster, especially heavy freight trains. This makes the work on the rails extremely severe. If the rail is soft the head will flow and spread. If the rail is made very high in carbon, with a view to preventing this, there then comes more danger of breakage, especially in very cold weather. The work put on the rails now is extremely severe, and a person standing close to the tracks and seeing a fast express train go by wonders that the rails stand at all. I think the particular cause of breakage is due to the fact that the rail has been given such an immense increase in severity of treatment, as compared with that which prevailed some years ago, that it is hardly to be expected that it would stand up under it. I think the rail makers are studying this very carefully now, and I have no doubt that a still heavier section of rail will be adopted if the present high speeds and heavy wheel loads are maintained.

THE CHAIRMAN. Does the driving wheel of an engine, moving at 40 or 50 miles an hour actually leave the tracks with the revolution of the wheel, so as to strike it literally a blow?

MR. KENNEDY. Yes. It is simply a matter of computation, having given the weight of the counter-balance in the wheel, to find the speed at which it does leave the track. But I believe almost any ordinary locomotive wheel when running about 65 miles an hour actually leaves the rail on each revolution. This has been gone into at Purdue University, Indiana, where they placed their locomotives on fixed wheels, and run them up to high speeds, from time to time running small lead wires between the wheels. This will show whenever the driving wheel leaves the supporting wheel and at a certain speed it actually lifts from it at every revolution.

MR. BARTLETT. Mr. Farrell testified that the railroads were demanding a harder rail that lasts longer.

MR. KENNEDY. Yes. It is very expensive for railroads to keep pulling out their rails and replacing them every few months. They want a rail that lasts.

MR. BARTLETT. Do you think that indicates that the hardness of the rails has been due to the demand of the railroads that they be given a rail that lasts longer?

MR. KENNEDY. No. They want to make them as hard as they can and keep them safe.

MR. BARTLETT. The purpose of making a steel rail softer—I will use that word—is not to diminish the cost of producing the rail?

MR. KENNEDY. Not at all.

MR. BARTLETT. But to make one that will last longer?

MR. KENNEDY. It is simply a question of which one is best, all things considered. If you get it too soft it wears out quickly, and if you get it too hard it breaks.

MR. BARTLETT. There is no advantage to the steel manufacturer to make it softer or harder?

MR. KENNEDY. None at all.

Steel Corporation Purchases of Pig Iron

THE CHAIRMAN. I find from the minutes of the Steel Corporation that there is continual reference made to the purchase of pig iron at various times. For instance, in the minutes of the Executive Committee this occurs:

> The president stated that he would like to obtain the views of the committee in regard to the advisability of the purchase of 30,000 tons of pig iron, at $18.50, for the third quarter of 1903, and for which we would exchange coke at the rate of $3 per ton; that we will require about 100,000 tons in that quarter—and so on.

I find another reference where they discussed the advisability, at a meeting of the Executive Committee, of purchasing 200,000 tons of pig iron. I find also, from the minutes of the Steel Corporation, where the statement is made that this purchase was advisable—I do not give the exact language, but I give the idea—in order to give stability to prices on pig iron. Now, is it economy to close blast furnaces, where they can run and you can utilize their output, and open up again—run them intermittently?

MR. KENNEDY. It would not be economy to close them for a short time and start them up often. It is easy to shut them down, if you want to stop for a month or two, and then start up again.

THE CHAIRMAN. Why should a blast furnace to be run economically be run regularly? Explain that to the committee.

MR. KENNEDY. It would not be good policy to shut down a blast furnace once a week, because it always disorganizes it and puts it out of condition, and it takes two or three days to get it straightened around again. But I take it that it would be different if you wanted to stop for a month, and then start up again.

THE CHAIRMAN. I believe that is the reason given for running blast furnaces on Sunday.

MR. KENNEDY. Yes.

THE CHAIRMAN. That it is a metallurgical necessity to keep running them after they are started?

MR. KENNEDY. Yes.

THE CHAIRMAN. The continued shutting down and opening up and starting the blast furnaces is an expensive operation.

MR. KENNEDY. If you stop blast furnaces often and start them up again they do not work very well for the next 24 hours.

THE CHAIRMAN. I find this statement by Mr. Gary. He states: "It would be better to even shut down some of our high-priced furnaces and be purchasers; that the price of our finished steel products being regulated by the price of pig iron we ought not to be endeavoring to get the cheapest iron; that we ought to maintain the price by little purchases; that $1 a ton is such a little thing compared with the advantages we receive in the finished products; that if we had purchased pig iron there would not have been the present downward tendency in it."

Now, as a practical steel man, I will ask you to tell me what advantage it is to the Steel Corporation to pay a dollar more for pig iron than the market price, and to so conduct their business as to have it raised a dollar a ton.

"Iron Age" Quotations and Sliding Scale Contracts

MR. KENNEDY. Well, steel companies often sell semi-finished material, such as billets, based on *Iron Age* quotations for pig metal. Of course, if the price of pig metal becomes demoralized it would lower the price of their billets, and it might be good policy to try and steady that price and prevent it from dropping.

THE CHAIRMAN. That is, prices of the finished steel products, or semi-finished products, sold for future delivery, are not sold at a fixed arbitrary price, but upon a sliding scale based upon the price of pig iron at the time of delivery of the consignment?

MR. KENNEDY. In some cases billets are sold for a year ahead. If one company should sell another company its requirements for billets for finishing steel, a year ahead, the contract is often predicated upon the price of pig iron from month to month, taken from *The Iron Age*.

MR. BARTLETT. The market for manufacturing pig iron is liable to go down, and to steady the market you buy for

the purpose of keeping it up; that would be like the man on the race track or in the stock market, hedging his bet.

MR. KENNEDY. Possibly somewhat on general principles.

THE CHAIRMAN. As I understand you, the purchase is made for, say, a year ahead, and the price is fixed at the delivery?

MR. KENNEDY. Yes.

THE CHAIRMAN. If they can, by buying or selling pig iron, regulate the price, they can in that way fix the price of this material?

MR. KENNEDY. Yes. If they can prevent a slump in the price of pig iron they will prevent a slump in the price of billets.

THE CHAIRMAN. Do you know of any other reason why the Steel Corporation should purchase pig iron, if it had the capacity to produce it in the blast furnaces, except to regulate the price?

MR. KENNEDY. Not unless they could buy some cheaper than some of their furnaces could make it.

Capital for Steel Plants and for Small Rolling Mills

THE CHAIRMAN. What is the difference in the capital required to operate a mill turning out billets economically and the capital required to operate a mill turning out tin plate, or something of that kind? Approximately what is the least amount of capital necessary to start the operation of a mill making tin plate?

MR. KENNEDY. Oh, you can start that with a half million dollars, if you could get your sheet bars.

THE CHAIRMAN. What capital would be necessary to economically and competitively produce those sheet bars?

MR. KENNEDY. I should not think you ought to start in with less than fifteen or twenty million, in order to stay in business.

THE CHAIRMAN. About a nail mill. Can they be operated economically without an integrated plant?

MR. KENNEDY. If you start it with billets, they make considerable of a plant—more than the other I have spoken of. If you buy your wire you could start in the same way.

THE CHAIRMAN. What do those nail machines cost?

MR. KENNEDY. From $300 or $400 to $1000.

MR. REED. Do you know of any concern in the country that ever stayed alive very long buying its wire and making its nails?

MR. KENNEDY. No, I do not think they could do it.

THE CHAIRMAN. Could they do it if they could get their semi-finished product at the same proportion? In other words, if the cost from the nails to the ore were equitably distributed, and the man with the nail mill got his share of the profits, could he do it?

MR. KENNEDY. Possibly he could; but the man who makes wire is very glad to put it into nails without much profit for the nail mill, rather than shut down his wire mill. You could not expect him to stop his wire mill as long as he could market wire by turning it into nails.

THE CHAIRMAN. What other finishing plants are there that could be operated at a reasonable cost without being integrated—the manufacture of tin plate, and what else?

MR. KENNEDY. Ordinary sheet iron would come under the same conditions; bridge work would be similar.

THE CHAIRMAN. Now, how about mills manufacturing merchant bar, bar mills? Are there a great many of them operated on a small capital?

MR. KENNEDY. Yes, there are a good many of them.

MR. YOUNG. What do these mills start with?

MR. KENNEDY. Some start with old rails. They slice them up and make cheap bars for reinforcing concrete. Some start with billets, which they purchase from the steel companies.

The Carnegie Tube Mill

THE CHAIRMAN. You spoke this morning, Mr. Kennedy, of having made an estimate of the value of the tube plants prior to the formation of the National Tube Company. Mr. Carnegie when he was on the stand stated he could build a tube mill at Conneaut that would make tubes at $10 a ton cheaper than they were being made by the National Tube Company. Do you know whether that could be done or not at the mill that Carnegie proposed to construct at Conneaut?

MR. KENNEDY. He could undoubtedly have made them cheaper. I don't know whether he could make them $10 cheaper, but he could have made quite a material difference.

THE CHAIRMAN. Why was that?

MR. KENNEDY. He at that time had the cheapest steel from his mills; he also had a railroad to the lake, and proposed to put that plant at Conneaut. He would have taken his coal on the back haul, where it would be very cheap to haul. He had an extremely cheap proposition for assembling raw materials, and he would have had his blast furnaces, rolling mills and tube mills all together, and have had very much of an up-to-date plant. The tube mill at McKeesport has been modernized since, and they have possibly saved nearly that much themselves, but at that time he could have made a very handsome difference in cost, I have no doubt.

Government Regulation

In the concluding part of his remarks Mr. Kennedy was asked for suggestions as to the regulation of large corporations by the Government. He advocated the divorce of transportation and manufacturing. He believed that every manufacturing company should be on an equality with others in respect to its treatment by the railroads. He thought most of the evils that had been complained of could be remedied by the correction of inequalities in transportation. He did not commit himself definitely in answer to the question whether it is necessary to have a combination, understanding or gentlemen's agreement between large corporations in order to keep stable prices for their products. He had seen such demoralization that he would hesitate to express an adverse opinion.

Mr. Reed, counsel for the Steel Corporation, followed Mr. Kennedy's testimony by communicating to the committee information it had asked the Steel Corporation to supply. Referring to the statement of Comptroller Filbert, showing 37,000,000 tons of ore uncovered by the Steel Corporation through its stripping operations on the Hill lands, he said that probably not more than 27,000,000 tons of that could be dug out by the open pit method of mining. As to the ore washing plant at Coleraine, Minn., he said this was built on property which the Steel Corporation controls and would not be surrendered with the Hill lease. The cost of construction was $1,500,218. This plant was built not only to wash the Hill ores but other ores that required concentrating and would be used after the termination of the Hill lease.

Replying to another inquiry, Mr. Filbert advised the committee in writing that the number of employees of the Steel Corporation receiving salary or wages of more than $2000 a year was 4106, their aggregate salaries and wages being $13,534,213. The total number of employees of the Steel Corporation, January 1, 1912, was 192,237.

The Canadian Westinghouse Company, Ltd.

The Canadian Westinghouse Company, Ltd., Hamilton, Ont., the stock of which is largely owned by the Westinghouse interests of Pittsburgh, held its annual meeting in Hamilton last week. The operations of the company for the year ended December 31, 1911, compare with the two previous years as follows:

	1911.	1910.	1909.
Net earnings	$1,010,153	$697,393	$498,379
Depreciation and reserve	200,000	130,000	70,000
Balance	810,153	567,393	428,379
Dividends	350,128	306,362	261,540
Surplus	460,025	261,031	166,839
Previous surplus	726,613	536,104	431,724
Total surplus	1,186,638	797,135	598,563
Written off	135,794	70,522	62,461
P. & L. surplus	$1,050,845	$726,613	$536,103

The capital stock of the company is $4,376,600. In addition to its surplus, the company carries reserve for depreciation, $500,000; reserve for inventory adjustment, $100,000; reserve for insurance, $50,000.

The Spencer Wire Company's New Department.—Another department has been recently added to its plant by the Spencer Wire Company, Worcester, Mass. This will be devoted to the manufacture of all kinds of wire rope, and the building housing it is the twenty-first to be erected since the plant was begun in Worcester 12 years ago. The rope wire will be galvanized by the old-fashioned hot process, which it is pointed out insures long life and satisfactory service in wet and exposed places.

The McKeen Motor Car Company, Omaha, Neb., has opened an office in the Hudson Terminal Building, 30 Church street, New York City, and has appointed Stephen D. Barnett as Eastern representative. This company has just received an order from the Weatherford, Mineral Wells & Northwestern Railroad for two 70-ft. motor cars. There are now 122 McKeen motor cars in service on railroads in the United States, Mexico and Australia.

The Machinery Markets

Improvement in trade conditions has been felt in several sections of the country in the last week, while in others there has existed one of the lulls in activity which come periodically. Generally there have been no unusual developments of recent date. New York has some good prospects pending and did fairly well in the month of March, largely as a result of vigorous salesmanship. New England conditions improved slowly and March is pronounced to have been a good month. Philadelphia buyers moved cautiously, as a result of which the last month did not equal February. Baltimore's trade has been irregular. Improvement has been experienced both in Cleveland and Cincinnati. In the latter city the export trade has maintained a good level and demands from the South and West in particular have made business better. In Cleveland, March, with scattered buying, forged ahead of February. There has been fair activity in Detroit, where the dealers are looking with expectancy to the requirements of a new motor truck company. Chicago had enough minor sales to make a good showing, although tendency on the part of buyers to purchase a cheaper class of machines worked injury to prices. The demand for second-hand tools was most noticeable in St. Louis. The South is using power machinery, but continues to await better weather. Texas is anticipating demands to result from extensive railroad building in that state. Calls for mining machinery have been coming from Alaska, and on the Pacific coast wood working machinery is in better demand than at the same time a year ago.

New York

NEW YORK, April 3, 1912.

The trade in New York is figuring on the machine tool requirements of the Safety Car Heating & Lighting Company, 2 Rector street, New York, for its extension of plant at 206 Erie street, Jersey City, N. J., which is the best new proposition of recent date to come before the trade. The contract has been let for a concrete building adjoining the present shops, and work on the foundation is going ahead. The tools required will represent an investment of many thousands of dollars. Pleasing orders for machinery have been placed in the last few days by several industrial companies, although the expenditures individually have not reached real large figures. The Mergenthaler Linotype Company has been buying a few tools for its Brooklyn plant. Orders of this kind, while widely scattered and usually obtained after diligent effort, made March a fair month with many of the trade, but not nearly as good as the same month a year ago. Inquiries have kept up in number and the trade feels that they will cause more than ordinary activity when they materialize. The Delaware & Hudson list, which has been pending since the first of the year, is yet to be closed. Second hand machinery has continued in good demand and some special lines of equipment—sugar machinery, for instance—is daily becoming more active in accordance with the season.

The H. W. Johns-Manville Company, 100 William street, New York, will open bids about April 5, through its architect, H. J. Esser, on the general contract for its new manufacturing plant which it is preparing to erect at Finderne, N. J.

The Turner Construction Company, 11 Broadway, New York, has been awarded the contract for the construction of a reinforced concrete abattoir at the foot of West Thirty-ninth street, New York, for Joseph Stern & Sons, Inc. The building will be 100 x 100 ft., nine stories and basement. Equipment plans have not been announced.

Frederick Hart, Poughkeepsie, N. Y., manufacturer of computing machines and scientific instruments, has purchased the tract known as the Ballard property in the Arlington section. Plans have been prepared for a building, one story, of steel and concrete construction and of the saw tooth type. The present factory on Lansing avenue is inadequate and the new building is to meet the growth of the business. The equipment will be moved from its present quarters to the new works, but much special machinery will be required.

The H. A. Smith Machinery Company has recently been organized to handle high grade machine shop equipment, with temporary offices in the Rosenbloom Building, Syracuse, N. Y.

Carver & Co., Fulton, N. Y., has received a general contract for the construction of an addition, 90 x 99 ft., two stories, of brick, to the power house for the Minetto-Meriden Company, Minetto, N. Y.

The Tissue Company, Saugerties, N. Y., has been incorporated with a capital stock of $80,000, and will build a plant for the manufacture of paper. F. Cramp, C. H. Coon, Saugerties, and C. F. Kantine, Kingston, N. Y., are the incorporators.

The Consolidated Gas Machine Company, Rochester, N. Y., has been incorporated with a capital stock of $175,000 to manufacture gas machines and apparatus, and will establish a plant. The incorporators are M. D. Colbrath, M. P. Willsea and T. W. Richardson, Rochester.

George N. Ramroth, Adams and Third streets, Troy, N. Y., will erect and equip a two-story and basement bottling works, 38 x 47 ft., of brick and concrete construction, on Third street.

The Modern Machine Tool Company, Albany, N. Y., has completed plans for a machine shop to be erected at 940 Broadway.

The New Process Rawhide Company, Syracuse, N. Y., manufacturer of gears, has plans in progress for two additions to its plant, one to be 66 x 125 ft. and four stories, the other 40 x 80 ft., two stories. The estimated cost of the improvements is $75,000.

The Hartford-Fairmont Company, Canajoharie, N. Y., has been incorporated with a capital stock of $60,000 to manufacture glassware, etc. E. W. Smith, Hartford, Conn., B. Arkell, New York City, and L. T. Hallett, Canajoharie, are the incorporators.

The Niagara Merchandising Company, Lockport, N. Y., has had plans prepared for a three-story factory building which it will erect and equip for the manufacture of laundry machinery.

The John Brown's Sons Company, Olean, N. Y., has been incorporated with a capital stock of $25,000 to manufacture cutlery, edged tools, etc. W. R. Brown, Tidioute, Pa.; J. W. Brown, Little Valley, N. Y., and R. E. Brown, Olean, are the incorporators.

W. H. Utter & Son, manufacturers of tobacco pipes and accessories, Olean, N. Y., is to build a large brick addition to its factory in South Third street, doubling its capacity.

Construction work has been commenced on the new plant of the Globe Malleable Iron & Steel Company, Syracuse, N. Y., to replace the buildings destroyed by fire in January. The main building will be 106 x 540 ft., the other structures being a storehouse, boiler house, pattern vault, etc. The approximate cost of the rebuilt plant, with equipment, will be about $100,000. The buildings will be of concrete and steel construction.

The Riley & Wands Company, Olean, N. Y., recently incorporated with a capital stock of $125,000, will erect a cold storage plant in North Division street, 40 x 100 ft., three stories and basement, of brick and steel construction.

The Sherman Harness Company, Buffalo, N. Y., has purchased a three-story brick factory, 30 x 130 ft., at Broadway and Pine streets, which it will remodel and equip with latest type machinery for the manufacture of harness and other leather goods.

The Foster-Milburn Company, 246 Michigan street, Buffalo, has completed plans for its new factory and laboratory, 90 x 100 ft., two stories and basement, at Main and Bryant streets. The architects, Colson & Hudson, are receiving bids for construction.

The Howard Iron Works, Buffalo, is making a small addition to its plant at Chicago street and the Lehigh Valley Railroad, giving it increased office and storage facilities.

The Noye Bros. Company, Buffalo, has filed articles of incorporation and will construct and repair mill machinery. The incorporators are Albert A. Noye and Richard K. Noye, Jr., formerly connected with the John T. Noye Company, manufacturer of flour mill machinery.

The H. O. Company, Buffalo, manufacturer of ce-

reals, has completed plans for a warehouse, 79 x 121 ft., four stories and basement, of steel construction with cement floors, which it will add to its plant at Perry and Fulton streets and the New York Central Railroad.

Catalogues Wanted.

The Rio Grande Hardware & Machinery Company, with retail stores in Texas, located in Mission, Mercedes and San Benito, has added a wholesale department to its business and requests manufacturers to send catalogues. The company deals in hardware implements, vehicles, gasoline engines, machinery and supplies.

New England

BOSTON, MASS., April 2, 1912.

Business continues to show signs of improvement. March was a good month for the dealers. The machine tool builders find orders increasing, in some cases slowly, in others with considerable rapidity.

Consolidation of Machinery Interests.

The business of the F. E. Reed Company, the Prentice Bros. Company, the Reed Foundry Company and the Reed & Curtis Machine Screw Company, together with the Cambridge street plant occupied by the Prentice Bros. Company and owned by the Crompton Associates, all of Worcester, Mass., have been consolidated into a new corporation known as the Reed-Prentice Company. The transaction is the outcome of options which have been held for some weeks by Harry W. Smith, Worcester. The corporation has a capital stock of $2,500,000, divided between $1,250,000 7 per cent. preferred and $1,250,000 common. The preferred has been purchased by the prominent Boston banking house of Lee, Higginson & Co. A part of the common stock will be held by the former owners of the several corporations in the amalgamation, and the remainder has been purchased by new interests. The officers of the corporation are: President, George F. Fuller, general manager of the Wyman & Gordon Company; vice-presidents, F. E. Reed and Vernon F. Prentice; secretary and treasurer, George Crompton, a director of the Crompton & Knowles Loom Works, and president of the Crompton Association; directors, Dr. Homer Gage, a director of the Crompton & Knowles Loom Works; Frank A. Drury, president of the Merchants' National Bank; Lucius J. Knowles, treasurer of the Crompton & Knowles Loom Works; John F. Kyes, head of the Reed Foundry; Albert E. Newton, general manager of Prentice Bros. Company; Harry V. Prentice, treasurer of the Prentice Bros. Company; together with Harry W. Smith and the officers. The F. E. Reed Company is one of the largest manufacturers of lathes in the world. The business was founded in 1875. The Prentice Bros. Company, founded in 1872, has an international reputation as a builder of geared head and other types of engine lathes and vertical and radial drilling machines. The Reed & Curtis Machine Screw Company was founded in 1903. The Reed Foundry was established in 1901, with a complete modern equipment for the manufacture of gray iron castings, and has been managed from the beginning by Mr. Kyes. The consolidated companies will manufacture a complete line of plain and geared head lathes, upright and radial drilling machines, machine screws and iron castings. The statement of the accountants who audited the books of the several companies shows that the earnings over the six years have averaged $200,000 per annum, after liberal charges for depreciation. Albert E. Newton will be the general manager of the new company.

The National Equipment Company, Springfield, Mass., manufacturer of confectionery and chocolate machinery, which will erect a large factory at Brightwood, states that it has not yet decided what new equipment will be installed. The purpose of the building is to give much needed additional manufacturing space. The main factory will be 80 x 360 ft., three stories, with a wing 80 x 100 ft., of mill construction with steel beams and columns. There will also be a power house. The factory will be located on North Main street adjoining the property of the Bosch Magneto Company.

The Norton Grinding Company, Worcester, Mass., manufacturer of grinding machinery, is occupying a large addition which consists of a duplicate of the units of its works together with a connecting building. The department for the building of the small grinding machines for the Norton company will be concentrated in a gallery of this building. In the connecting wing a demonstration department has been established where the different types of grinding machines built by the company may be seen in operation and where samples of the product are on exhibition.

The season promises to be one of exceptional activity in the shipyards of Maine. A large number of coasting vessels have gone to pieces in the storms of the last few winters and have not been replaced. The result is a growing dearth of this form of transportation facilities, and owners are planning to meet the demand with new vessels. The large yards at Bath are very busy. The Bath Iron Works has its usual quota of torpedo-boat destroyers and other ships and the Hyde Windlass Company of the same city is furnishing equipment for a large number of government and other vessels.

Additions to general manufacturing plants in New England include the following: G. H. Gilbert Mfg. Company, Gilbertville, Mass., a large brick boiler house; Taylor Burt Paper Company, Holyoke, Mass., four-story brick factory building; Strouse Corset Company, New Haven, Conn., three-story fireproof building 47 x 70 ft.; the Ponemah Company, Taftville, Conn., brick factory to cost $50,000.

The stockholders of the Risdon Tool & Machine Company, Naugatuck, Conn., have formally voted to move the factory from Waterbury to Naugatuck and the board of directors have been authorized to secure a site for a factory building.

The Hart & Heggeman Mfg. Company, Hartford, Conn., manufacturer of electrical specialties, will increase its works by putting an additional story on a three-story building 60 x 200 ft. The space will be given up to offices.

The French Mfg. Company, Waterbury, Conn., will erect a new factory 40 x 80 ft., one story, and 40 x 100 ft., two stories, of brick with steel columns, girders and trusses. A present factory will be torn down and the new building erected on the site. The company manufactures small tubing in brass and other composition metals.

The Rhode Island Fitting Company will erect a factory at Hillsgroove, a suburb of Providence, adjacent to the plant of the Rhode Island Malleable Iron Works, with which the business will be closely affiliated. It is a new corporation with a capital stock of $25,000, and will manufacture unions and all kinds of pipe fittings. Cyrus P. Clough is the president, and Charles Brown, Lawrence, Mass., secretary and treasurer. The other incorporators are: John H. Dickenson, Providence, and Emery G. Smith, Arlington, Mass. Mr. Clough is an owner and the general manager of the Malleable Iron Works. The Rhode Island Fittings Company will erect a building 25 x 150 ft. so arranged as to permit of an extension to 600 ft. in length. The Malleable Iron Works will build an addition to its annealing room 40 x 60 ft. This company will make the castings for the new corporation.

Philadelphia

PHILADELPHIA, PA., April 2, 1912.

Reports received from both merchants and manufacturers of machinery and tools indicate that the volume of new business in March was somewhat smaller than that of the previous month. Manufacturers have probably not felt this as much as have the merchants, inasmuch as the former have had sufficient business on hand to enable them to maintain about an even rate of production. One notable exception is that of the Baldwin Locomotive Works, which booked a larger volume of new business in March than for many months past and now looks forward to an early resumption at full capacity.

There is still a certain hesitancy in the air as to future conditions. With the suspension of mining in the anthracite coal region, business in that section is inclined to halt. Buyers of machine tool equipment move cautiously and seem unwilling to make definite forward movements. Propositions which have been in sight for some months do not appear much nearer, at least as far as machine tool equipment is concerned. In instances, quiet buying has been done on the part of some concerns who have increased capacity programmes under way. The bulk of the general business is still confined to single tool propositions principally for replacement or for minor extension. The export trade has been confined to a few special tools and machinery, with a fair volume of business in power transmission equipment. Considerable moderate capacity power equipment is under negotiation, but owing to the backward open season and the consequent delay in building operations, action on many of these propositions has been retarded. The second hand machinery

market shows a moderate movement, but is by no means active. Steel casting plants have been receiving a better run of orders and are more actively engaged. An even volume of business is moving in machinery and general gray iron castings.

Peuchert & Wunder, engineers, announce that the contract for the new power house for the Reading Brewery Company, Reading, Pa., has been awarded to L. H. Focht, of that city. Wickes Bros. will install the boiler plant, while the Link-Belt Company will equip the plant with coal and ashes handling machinery.

The Ferracute Machine Company, Bridgeton, N. J., has experienced some improvement in business in the past month, although the majority of the orders have been for foreign account. Domestic inquiries have been particularly good, in fact better than for any time in six or eight years, and many are of a very promising nature.

The Sheeler-Hempsher Company, brass founder, is taking estimates on plans for extensive additions to its plant, including a one story and basement storage building, 26 x 52 ft. for metals and a 26 x 100 ft. addition to the general foundry building. This will more than double the molding floor space and also provide additional shipping, cleaning and pattern storage facilities. An increase in its power equipment is under consideration and later on purchases of additional machinery for finishing purposes will be considered.

Bids are now being taken on the construction of the additions to the foundry and machine shop, recently mentioned, for the General Engineering Company, Front and Kenilworth streets. The building will be 148 x 157 ft. As already announced the present equipment will cover the present needs of the concern.

The contract for the additions to the plant of the Victor Talking Machine Company, Camden, N. J., from plans by Ballenger & Perrot, engineers, has been awarded to Irwin & Leighton. The addition will be 72 x 172 ft., five stories, erected over the present power plant. It is to be of fireproof construction throughout, steel window sash is to be used and two passenger elevators will be installed.

Ballenger & Perrott, engineers, are taking bids for the new plant for the Ottomobile Company, to be erected at Mount Holly, N. J. The building is to be 64 x 402 ft., one story. The matter of power equipment is now being considered.

The R. S. Newbold & Son Company, Norristown, Pa., is operating its plant at about 80 per cent. capacity. Inquiries have been quite numerous and some very satisfactory orders have been recently taken, including a 200 ft. conveying table for the Allegheny Steel Company and several orders for briquetting plants. Orders for two 175 hp. boilers, with a 6 x 100 ft. stack, have also been received from the W. F. Read & Sons Company, Philadelphia, Pa. Its export shipments included a circle cutter, having a capacity of cutting 12 ft. x 1 in. circles, to a large steel works in Austria.

The Earle Gear & Machine Company has a large volume of business on its books covering special machinery for Government service, a large amount of work for the New York State Barge Canal, automobile work and considerable work in special machinery and pumps. Inquiries have been coming out very freely and the outlook for better conditions is considered favorable.

The Frick Company advises that business in its heavy lines, including ice and refrigeration machinery, which includes about two-thirds of its total business, is about 20 per cent. ahead of last year at this time. In the lighter lines, including traction and portable engines, engines for road work, grading, plowing, etc., and sawmill machinery, business is from 5 to 10 per cent. ahead of last year.

Ford & Kendig are taking estimates for the erection of a two story addition to its plant at Twenty-fourth and Wood streets, from plans by Sauer & Hahn. The building will be used for warehouse purposes only and no machinery or power equipment will be needed.

The William Steele & Sons Company has begun work on the new machine shop to be built for the C. H. Wheeler Mfg. Company at Lehigh and Sedgely avenues. The building will be one story, 125 x 213 ft. A 26 x 54 ft. boiler house and coal storage building will also be erected.

The Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa., has been taking a better run of orders during the past month, considerably in excess of that for either January or February. Several orders for large electric pressure pumps have also been received.

The Baldwin Locomotive Works has booked a considerable amount of new business. Orders have been entered for 40 engines for the Atlantic Coast Line and 25 for the Great Northern. Orders for 30 locomotives from Western roads, including the Chicago & Great Western and International & Great Northern, have been closed, as have also a number of odd engines from smaller roads and industrial concerns.

S. Ewin Diehl & Co., manufacturers of bottlers' supplies, have had plans prepared for a six-story warehouse to be erected at 250-252 North Third street. Jacob Naschold, architect, is taking bids for the work. Elevators and boiler equipment will be installed.

Baxter, Kelly & Faust, textile manufacturers, are considering the erection of a five-story reinforced concrete addition, 60 x 150 ft., to their plant at Tioga and C streets. A decision will not be reached for 30 days.

The Light Mfg. & Foundry Company, Pottstown, Pa., has sufficient orders on hand to keep it well occupied for six or seven months. This concern is adding a few improvements to its plant in the way of machinery and tools, and hopes within the next 60 days to carry out plans previously mentioned for doubling the present capacity of its plant.

Baltimore

BALTIMORE, MD., April 2, 1912.

Buying in March was somewhat irregular and the business largely confined to propositions of the smaller class. Purchases of equipment, usually seasonable at this time, have dragged. Outdoor work has been seriously interfered with by unfavorable weather conditions, and inquiries which usually come out early in the spring are only beginning to show signs of development. The demand for contractors' equipment is now opening up in a satisfactory manner. Boiler and engine business has been along narrow lines, and the demand is not very active, being confined principally to small propositions. Machine tool sales have not been large individually; metal working tools have been in fair demand in single tools or small lots; a moderate business in woodworking tools has also been moving. Special machine tool builders keep actively engaged, although in instances orders have been coming in less freely. While fabricators of building material are somewhat better engaged, the bulk of the orders are small, largely in connection with warehouse purposes. Several fairly good propositions are being figured on, however, both in this city and in the South. Railroad buying is still restricted, although some few scattered inquiries for tools have come out. Generally speaking, the trade views the prospects for improved conditions during the current month more hopefully. With inquiries in hand as well as prospective business, a material betterment in conditions is anticipated.

The Wm. E. Hooper & Sons Company has let the contract for an extensive addition to its plant at Woodberry to Henry Smith & Son, contractors. Plans call for a four story structure of steel, brick and concrete, thoroughly fireproof. The new building will provide room for a large number of looms and other machinery required by the expansion of the plant.

Michael T. Horner, who is interested in the Jones Hollow Ware Company, has purchased the plant of the Montford Machine Castings Company, Montford aveone and Chase street, which has been idle for over a year. Plans are now being made to make necessary repairs, etc., to place the plant in shape for operation in four to six weeks.

The W. J. Knox Net & Twine Company is building a fireproof boiler and storage house, 34 x 42 ft., adjoining its plant on Johnson street. Part of the equipment has been provided for, purchases being made through the Linen Thread Company, Paterson, N. J.

Louis Eckels & Sons, ice manufacturers, have begun the erection of a shop at 236-238 South Register street. This will be used for repair work in connection with its own equipment. Its principal tool requirements have been provided for.

The Baltimore & Ohio Railroad has taken bids for two 150 kw. engines and generators, and is understood to be in the market for additional general equipment for the power station at its Riverside plant in this city.

Theodore W. Pietsch, architect and engineer, is preparing plans for a six story addition for the Hotel Joyce, Camden street. The proposed building is to be of brick, terra cotta and steel, 60 x 158 ft. Elevators and a steam heating plant are to be installed.

The Tube Bending & Polishing Machine Company has been booking fair orders for automatic polishing and hand bending machines. A number of new machines are being developed and the company is contemplating some plant extensions, although nothing definite has been decided upon.

Plans have been prepared by J. H. Sherman for a

brick warehouse, 20 x 80 ft., four stories, to be erected at 38 South Calvert street. It is understood that a freight elevator and heating plant are to be installed.

The Ellicott Machine Company is progressing favorably with its plant additions on the old quarantine site. It will be several months, however, before they are ready for occupancy. The major part of the equipment for the new plant has been purchased. The present plant is being operated at full capacity, orders for dredging machinery, its principal product, having been comparatively good.

Wyatt & Noelting, architects, are preparing plans for a 12 story office building for Robert Garrett & Sons, to be erected at the southwest corner of German and South streets. Tentative plans call for a steel frame, brick and limestone, fireproof building. Plunger elevators, it is understood, will be installed. Plans are expected to be ready for estimate at an early date.

Articles of incorporation have been filed by the Frederick & Hagertown Power Company, with a capital stock of $500,000, the incorporators being Emory L. Coblentz, Frederick, Md.; Henry Holzapfel, Jr., and Victor M. Cushman, Hagerstown, Md.; E. W. Poe, Baltimore, and H. L. Witridge, Stevenson, Baltimore County, Md. The purposes of the concern are to conduct an electric light and power business, in all its branches. Proposed plans include the erection of a large power plant on Antietam Creek, near Hagerstown, Md.

Chicago

CHICAGO, ILL., April 2, 1912.

In the past month there have been few single orders for machine tools placed that were individually of unusual importance. For that reason the volume of business from week to week has seemed rather light, but dealers find that the steady run of orders for one and two machines has aggregated a very satisfactory total. It is understood that, with the possible exception of the structural fabricating tools on the recent Wabash Railroad list, none of the machinery inquired for has been purchased. A nearby foundry is in the market for an 8-ft. boring mill with two heads, a 5 to 7 in. horizontal boring and milling tool, a 5-ft. radial drill, a 38-in. heavy duty engine lathe and a 6-ft. planer with three heads. All of these tools are to be equipped for motor drive on a 220-volt direct current line. Prices for machine tools have suffered rather severely under the stress of recent conditions, particularly as a result of a temporary willingness on the part of buyers to accept less expensive machines.

The Miehle Printing Press Company, Chicago, is completing arrangements preparatory to the building of a plant at Plymouth, Ind., of a size sufficient to employ 200 men.

The Lyon & Healy Company, Chicago, has purchased six acres in Chicago on which it is the expectation to build a plant for the manufacture of pianos.

The Simplex Refrigerating Machine Company, Chicago, has been organized with a capital stock of $200,000 to manufacture ice machines. The incorporators are S. Borglund, J. A. Olson, and S. O. Hawkinson.

The Dairy Farm Products Company, Chicago, has purchased a site at 509 Union street, upon which factory buildings are to be erected at a cost of $200,000.

The Specialty Concrete Company, Chicago, has been incorporated with a capital stock of $325,000 to manufacture concrete products. The incorporators are Wm. M. Hatch, James R. Petterson and Frederick A. Allwerdt.

The Ingals-Shepard Forging Company, Harvey, Ill., is completing an addition to its plant 50 x 100 ft. in which is to be installed increased boiler capacity and additional hammer equipment. An increase of stock has been voted.

The Havana Metal Wheel Company, Havana, Ill., is rebuilding its plant recently destroyed by fire and will have a fireproof concrete structure.

The Bonner Mfg. Company, Champaign, Ill., is adding still further to its plant facilities by the erection of a building for heat treatment 40 x 80 ft., and a finishing building 24 x 100 ft.

Reardon Bros., Waukegan, Ill., have let a contract for the erection of additions to their plant 50 x 70 ft., three stories. The factory will be rushed to completion as fast as weather will permit.

Announcement has been made that the Star Mfg. Company and the Illinois Iron & Bolt Company, with plants at Carpentersville, Ill., have been consolidated. The Star Mfg. Company was organized by J. A. Carpenter, W. G. Sawyer and H. G. Sawyer in 1873. It will be absorbed by the Illinois Iron & Bolt Company, and under the consolidation a combined capital stock of $1,850,000 will be effected.

The Illinois Silo Company has secured a location at Bloomington, Ill., and has awarded the contract for the erection of a factory building.

The Iowa Iron & Metal Company, Des Moines, Iowa, is considering the locating of a foundry on the Pacific coast and is investigating with a view to obtaining a site for a plant.

The Baker Mfg. Company, Fort Dodge, Iowa, has plans completed for the erection of a fireproof building to cost $40,000, construction to begin as early as possible.

The Keokuk Hydraulic Tire Setter Company, Keokuk, Iowa, has been organized with an authorized capital stock of $50,000. The incorporators are C. A. Devero, J. A. Mock and M. L. Mock.

The Evinrude Motor Company, Milwaukee, Wis., has awarded the contract for the erection of a reinforced concrete building 75 x 140 ft., two stories, at Walker and Reed streets.

The Tomahawk Iron Works, Tomahawk, Wis., will be known hereafter as the Tomahawk Steel & Iron Works. It has increased its capital stock from $15,000 to $30,000. The company will manufacture boilers, tanks, and other steel plate work.

The John Hoberg Paper Company, Green Bay, Wis., has added to its plant a large machine shop in which equipment is now being installed.

The Evered Foundry & Machine Company, Duluth, Minn., has taken out building permits for two new buildings to be erected at a cost of $3,000.

The St. Paul Rim & Axle Company, St. Paul, Minn., is arranging to build a factory for the manufacture of automobile parts, including axles, transmissions, rims and forgings.

Cleveland

CLEVELAND, OHIO, April 2, 1912.

Business is gradually improving with local machine tool builders. Buying is considerably scattered. Some small orders for tools to fill in are coming from the automobile trade. There is some improvement in railroad buying, although purchases are being made on a small scale. Orders received by local machine tool dealers in the week were light, the market being less active than in the previous week. March as a whole, however, showed quite a satisfactory improvement over the first two months of the year. Owing to the closing of some small plants there is a larger amount of second-hand machinery on the market than usual at this time and this is being offered at attractive prices.

Plans for remodeling and enlarging the municipal electric light and waterworks plant in Clyde, Ohio, have been prepared by the Moore Engineering Company, Cleveland, Ohio. New equipment to be purchased will include one 200-kva. and one 100-kva. direct-connected generators and two centrifugal pumps with capacity of 400 gal. each.

Plans for a new factory building for the Lima Locomotive Works, Lima, Ohio, have been prepared by Albert Kahn, architect, Detroit, Mich. A fireproof steel building 50 x 80 ft., one and two stories, will be erected.

The Cadillac Motor Car Company, Detroit, Mich., is considering the erection of a large branch plant in some city other than Detroit. Efforts are being made by the Commerce Club of Toledo, Ohio, to secure the new plant.

C. B. Wilson, the new president of the Cleveland branch of the National Metal Trades Association, will address the Cleveland Shop Superintendents & Foremen's Club April 20. His talk will be along efficiency lines.

The Charles Stamp Company has been incorporated with a capital stock of $15,000 to succeed C. E. Stamp & Co., machinery dealers, 503 New England Building, Cleveland, Ohio. No changes are contemplated in the conduct of the business.

The Peet Machine Company, Cleveland, Ohio, has been incorporated with a capital stock of $10,000 by A. J. Peet and others to manufacture machinery, tools, dies and automobile parts. The company will succeed in the business that has been conducted by a concern of the same name at 520 Prospect avenue N. W. No changes are planned in the management.

John L. Willys, owner of the Willys Overland Company, automobile builder, Toledo, Ohio, has acquired controlling interest in the Gramm Motor Truck Company, Lima, Ohio, maker of commercial trucks. The

name of the company will be changed to The Willys-Gramm Truck Company.

A new sewage disposal plant will be installed by the village of Port Clinton, Ohio.

The Ajax Mfg. Company, Cleveland, reports a considerable improvement in the demand for forging machinery. This company has recently received an order from a western implement concern for five high-speed bulldozers and has also just booked orders from railroads for nine machines.

The city of Cleveland is planning the installation of a municipal brick and tile plant at an expenditure of $11,000.

The Northern Blower Company, Cleveland, Ohio, which was organized a few months ago, has just completed a new plant at 4516 Storer avenue. The company does a general sheet metal work business and installs dust-collecting systems. M. A. Eiben is manager.

The City Council of Steubenville, Ohio, has authorized the expenditure of $32,000 for improvements to the municipal waterworks plant. It is stated that new boilers will be installed and that a 1,000,000-gal. pump will be added to the equipment.

Nathan B. Gordon, George S. Cole and F. B. Bicknell have been appointed receivers of the Superior Drop Forge & Mfg. Company, Cleveland, Ohio, as a result of bankruptcy proceedings instituted against this company.

On application of the trustee of the bondholders and one of the creditors the General Foundry Company, Warren, Ohio, has been placed in the hands of Warren Thomas as receiver. The company recently established a plant in Warren, having moved there from Bradford, Pa.

The Jefferson Glass Company, Jefferson, Ohio, will enlarge its plant by the erection of an addition 42 x 200 ft.

The National Screw & Tack Company, Cleveland, Ohio, has let a contract for the erection of an addition to its plant. A brick and steel structure 37 x 50 ft., five stories, will be built.

Cincinnati

CINCINNATI, OHIO, April 2, 1912.

General business conditions in all manufacturing lines show some improvement. So many orders have been held up on account of the severe winter just passed that it is quite probable the next few months will make a phenomenal showing for a National election year. The machine tool people report an improving business in the South and West, while the export trade continues to hold its own. The last report issued by W. B. Dickson, Cincinnati, secretary of the National Metal Trades Association, indicates that local plants were operating at about 83 per cent. of capacity during the quarter ending March 15, which is considered a very good showing for the period in question.

Second-hand machinery dealers are doing a good business and the foundries report a slightiy increasing melt during the past days with considerable prospective business in sight.

The John C. Thom Company, Cincinnati, now located at 1215-1225 West Eighth street, has acquired a site on Price Hill, on which will be erected a large planing mill. Considerable extra equipment will be required, including a number of electric motors.

The L. Schreiber & Sons Company, Cincinnati, has been awarded contract for the addition to the John Hauck Brewing Company, recently mentioned.

The Miami Cycle & Mfg. Company, Middletown, Ohio, has increased its capital stock from $700,000 to $1,100,000 and has awarded contract to Bert. L. Baldwin, Perin Building, Cincinnati, for a four-story addition to its plant. The new building will be of reinforced concrete construction, 60 x 300 ft. The plans also call for an office building, 50 x 80 ft., and two stories.

The Guyan Valley Planing Mill Company, Logan, W. Va., has been incorporated with $10,000 capital stock. C. V. White is named as one of the principal incorporators.

The Cincinnati Car Company has changed its plans and instead of erecting several buildings at Winton place has decided to erect one large building to house all of its different departments. Work on the new structure is expected to commence within the next 60 days.

The Allyn Engineering Company, Second National Bank, Cincinnati, will soon ask for bids on two large manufacturing buildings to be erected in Ohio. Details are not yet available.

The Union Gas & Electric Company, Cincinnati, has had plans prepared for a one-story reinforced concrete substation to be erected at the corner of Myrtle avenue and Preston street.

The H. L. Brown Fence Company, Cincinnati, is having plans prepared for a new factory that will more than double its present output. The company is not now ready to consider bids for the new equipment necessary, but will probably be in position to award contracts within the next 30 days.

The plant of the Standard Milling Company, Norwood, Ohio, will be sold at public auction on April 17. The Ezekiel & Bernheim Company, Cincinnati, have the property in charge.

Considerable structural material, plumbing and heating equipment will be required for the proposed Fifteenth District School building in Cincinnati. Architects Garber & Woodward, Andrews Building, Cincinnati, drew up the plans and will soon advertise for bids. The proposed building will cost about $265,000.

B. A. Wesche has succeeded to the business of the Swing Eiectric Company, who recently went into the hands of a receiver. The company's plant is located at 327 East Sixth street, Cincinnati.

To deal in power, heating, lighting and ventilating equipment the J. M. Wikel Engineering Company, Cincinnati, has been incorporated with $50,000 capital stock. The incorporators are: J. M. Wikel, C. Fogelsong, C. T. Hughes and N. E. Bachman. The company has offices in the First National Bank Building and has heretofore been doing business under the name of J. M. Wikel & Co.

The Lewis File Company, Beach City, Ohio, has been incorporated with $10,000 capital stock to operate a general machine shop. David D. Lewis is one of the principal incorporators.

To manufacture and deal in eaves troughs, metal tanks, poultry fountains, etc., the Swanton Mfg. Company, Swanton, Ohio, has been incorporated with $10,000 capital stock by C. Glecker, Charles C. Schell, William Knierim and others, all of Swanton.

L. E. Stegner, Lewisville, Monroe county, Ohio, is in the market for machine shop equipment, including a 600 to 800-lb. trip or power hammer, one medium size lathe, one 12 to 16-in. shaper, one drill press with supplies, shafting, pulleys, etc.

Detroit

DETROIT, MICH., April 2, 1912.

Local machine tool dealers report considerable business transacted the past week in single tools and small lots up to 10 tools, sales of metal working tools predominating. Shop equipment and small tools are in active demand. The automobile industry is the source of some orders and new requirements from this direction are looked for, as several additions to plants will soon be made. The trade is also interested in the report that the formation of a new company with a capital stock of $500,000 to manufacture motor trucks is practically completed. It is announced that the company will build a plant here. A fairly good demand for handling machinery is noted. In several lines of special equipment such as laundry machinery and sugar mill equipment a number of inquiries have come out. There is considerable call for second-hand machinery.

The Briggs Mfg. Company, maker of automobile bodies, has begun the erection of a new factory at Denton avenue and the Grand Trunk Railroad. The new building will be 88 x 289 ft., four stories, of brick and mill construction.

The R. C. H. Corporation, automobile manufacturer, has taken out a permit for the erection of a one-story brick factory to cost $50,000. The mechanical requirements for the addition are not available at present.

The Dixie Laundry Company has been incorporated with $10,000 capital stock to operate a laundry. G. Roger Hawkins is the principal stockholder.

The Alden-Rukamp Company has been incorporated with a capital stock of $15,000 by Ralph J. Alden, C. A. Rukamp and A. W. Munsell. The company will engage in the manufacture of builders' supplies.

The Detroit Shipbuilding Company is inquiring for a 30 to 40 ton electric crane to serve its machine shop floor.

The Simplex Self Starter Company has been incorporated with $10,000 capital stock to manufacture a starting device for automobiles. Wallace N. Osburn is the principal stockholder.

The C. H. Little Company, manufacturer of building and paving supplies, has purchased a tract of seven acres on the western city limits for use as a gravel ter-

minal. The company also proposes to erect a plaster mill on the tract.

The Chamberlain Metal Weather Strip Company, whose plant was recently destroyed by fire, has announced that it will locate its main factory at Peru, Ill. The executive offices and a branch factory will be maintained in Detroit.

The Timken-Detroit Axle Company, maker of automobile axles, has begun the construction of a four-story brick and steel factory building adjoining its present plant at Clark avenue and Wabash Railroad.

The Detroit Brewery Company has awarded contracts for the erection of a brick addition to be used as a condenser house.

The Union Sheet Metal Works will erect a one-story brick factory and warehouse at 317-319 Farnsworth street.

The River Raisin Paper Company, Monroe, Mich., has issued $100,000 in bonds, the proceeds of which will be used in part for the erection and equipment of a large addition to the paper box factory.

The Dearborn Printing Company, Holland, Mich., has been incorporated with $100,000 capital stock to do a printing and engraving business. The company will immediately erect and equip a large plant on a site of five acres already secured.

The Pintsch Compressing Company has completed plans for the construction of a plant at Sault Ste. Marie, Mich., for the making of compressed gas and appliances. The preliminary outlay for the plant and equipment is estimated at $20,000.

The Sturgis Grain Company, recently organized at Sturgis, Mich., is planning the immediate erection and equipment of a 40-barrel flour mill.

The Frankenmuth Light & Power Company, Frankenmuth, Mich., has been incorporated with $50,000 capital stock to operate a public service plant. The incorporators are: Franz Rauke, Michael Kern and Augustus F. Schmidtke.

Mark Merriman, vice-president of the Hayes Wheel Company, Jackson, Mich., has acquired the plant formerly occupied by the Prouty Company and will equip it for the manufacture of parts of automobile wheels.

The South Michigan Brick Company has been incorporated with $40,000 capital stock to operate a brick plant. The directors are: John L. Jackson and E. D. Church of Saginaw and H. O. Joseph of Grand Rapids.

The Interchangeable Fixture Company, Grand Rapids, Mich., will build an addition to its plant 60 x 100 ft. and two stories in height and will install equipment sufficient to double its facilities.

The Commercial Service Truck Company, Grand Rapids, Mich., has been organized with $175,000 capital stock by Philip Moran, J. W. Laudman, G. H. Greenbauer and others. The new company is a reorganization of the Van-L Truck Company and some extensions may be made later on.

The W. E. Hill Company, Kalamazoo, Mich., has been incorporated with $225,000 capital stock. The new company has taken over the business of W. E. Hill & Co., manufacturers of mill and woodworking machinery.

The Wolverine Brass Works, Grand Rapids, Mich., is having plans prepared for a four-story factory building which it will build this spring.

It is reported from Grant, Mich., that the Grand Rapids-Muskegon Power Company will build a transformer station in that village this spring.

The taxpayers of Traverse City, Mich., have voted to bond the city for $150,000 for an electric lighting plant. It is the intention of the municipality to purchase the plant of the Queen City Power Company.

Indianapolis

INDIANAPOLIS, IND., April 2, 1912.

The Indianapolis Metal Products Company, Indianapolis, has been incorporated with $30,000 capital stock, to manufacture metal castings, etc. The directors are Frank Thomson, Ivan Ellis and L. B. Sulgrove.

John Stewart & Son, Indianapolis, have been incorporated with $5,000 capital stock, to do a general construction business. The directors are John Stewart, E. J. Stewart and H. H. Stewart.

The Shiel-Chapin Construction Company, Indianapolis, has been incorporated with $30,000 capital stock, to do a general construction business. The directors are W. R. Shiel, W. P. Chapin and M. H. Chapin.

The Sunshine Specialty Mfg. Company, Indianapolis, has been incorporated with $25,000 capital stock, to manufacture metal and other novelties, tools and machinery. The directors are C. H. Shaw, F. M. Shaw and W. H. Bridges.

C. M. Atterbury, representing the Fireproof Products Company, Chicago, was in Indianapolis recently looking for a site for a factory to manufacture concrete flooring material. He said the factory it was proposed to build will employ 100 men.

The Shirley Radiator & Foundry Company, manufacturer of boiler and radiators, has decided to locate its new plant at Beech Grove, Indianapolis. The temporary general offices are now in the Union Trust Building, Indianapolis.

Plans have been accepted from architect Herbert L. Bass for an addition to the plant of the Cole Motor Car Company of this city. It will be of reinforced concrete, four stories, and will cost $100,000. J. J. Cole is president of the company.

The Electric Welder Company, Kokomo, Ind., has increased its capital stock to $10,000.

The Sullivan County Water Company, Sullivan, Ind., recently incorporated with $75,000 capital stock, has been granted a 25-year franchise and will construct a waterworks system, drawing the water from driven wells 10 miles from the city.

The Johnson & Rasch Company, Gary, Ind., has been incorporated, with $50,000 capital stock, to build water craft. The directors are F. J. Johnson, Bertram Rasch and Joseph Wolter.

The Reliance Foundry Company, Richmond, Ind., has been incorporated, with $30,000 capital stock, to do a general foundry business. The directors are E. I. Hunt, G. L. Schultz and Howard Hunt.

The Bourbon Silo Company, Bourbon, Ind., has been incorporated, with $40,000 capital stock, to manufacture silos. The directors are S. P. Selby, L. P. Swoverland and F. H. Foe.

A special election will be held in Columbus, Ind., April 16, to vote on the proposed building of a mechanical filter, to cost $65,000.

The Hollingsworth-Turner Company, South Bend, Ind., has been incorporated, with $100,000 capital stock, to manufacture ice machines and their products. The directors are W. B. Hollingsworth, J. L. Turner, W. M. Hildebrand, G. D. Staples and D. P. Clem.

E. Burner & Co., South Bend, Ind., have been incorporated with $50,000 capital stock, to do a general contracting business. The directors are E. E. Burner, O. A. Burner and O. E. Julian.

The L. W. Rook Construction Company, Hartford City, Ind., has been incorporated with $40,000 capital stock, to do a general contracting business. The directors are L. W. Rook, H. H. Holbrook and John Burns.

Charles Favorite, Winchester, Ind., manufacturer of school cars, will build an addition to his plant.

The F. Grote Mfg. Company is completing preparations for the building of a new plant at Evansville, Ind., to cost about $50,000. The buildings will include a foundry, machine shop, woodworking plant, pattern storage, and power plant, and will be of steel construction, the Grote company doing its own fabricating.

The South

LOUISVILLE, KY., April 2, 1912.

A more generally optimistic feeling prevails in the local market, due to the large number of inquiries for equipment of all kinds that have been received. While a lot of this business remains unclosed because of bad weather, the general opinion is that as soon as conditions in this respect improve business will be as good as could be desired. There are plenty of new manufacturing enterprises starting up, while construction work is taking a lot of equipment. Power machinery is in good call and woodworking equipment will be a brisk mover with the opening of the weather. Sawmill operators, especially the smaller ones, have not been able to do anything during the past few months on account of continued rains, and as long as roads remain bad logs and lumber cannot be hauled. Business with them is a month or more behind, but dealers in sawmill equipment state that the number of inquiries in hand insures heavy trade when things begin to open up.

The Louisville Veneer Mills, which recently decided to substitute electric current for steam power, has let a contract for the 35 motors, aggregating 425 hp., to the James Clark, Jr., Electric Company of Louisville.

The Henry Vogt Machine Company, Louisville, reports the outlook good. In its structural department the company has been doing some extensive sheet steel work for grain elevators.

The Louisville quarters of the Otis Elevator Com-

pany have been concentrated at 206 West Main street, a large three-story building having been secured. The company has moved its offices from the Lincoln Building and its shops from another structure some distance away. Albert E. Scott is manager of the Louisville office.

The Louisville plant of the Standard Sanitary Mfg. Company is installing three grinders of the Valley City Machine Works. They were sold by E. D. Morton & Co.

Grainer & Co., structural iron manufacturers, are making some changes in their buildings and are contemplating the installation of some new equipment. Exact plans have not yet been worked out. A. P. Sikking has been elected secretary and treasurer of the company, succeeding W. H. Dennes, resigned.

William T. Montgomery is head of a company which has been formed at Otisco, Ind., near Louisville, for the purpose of erecting and operating a canning factory.

Control of the United Water, Light & Traction Company, Somerset, Ky., has passed into the hands of outside interests and new officers have been elected. A number of improvements will be made in the waterworks at once, these including the installation of a filtration system, while an addition to the power house may be provided for later on.

The cut stone plant operated by the Kentucky Freestone Company, at Langford Station, near Mt. Vernon, Ky., was burned with a loss of $7,500. The mill was owned by Franklin Alter of Cincinnati. It is understood that he will rebuild.

E. D. Johnson and J. S. Maddox are to erect a cotton gin at Hickman, Ky. It will be operated by electric motors.

W. E. Barron, Lexington, Ky., is organizing a company for the establishment of a steam laundry.

The Burley Tobacco Society, with headquarters at Lexington, Ky., has announced plans for the installation of prizing apparatus and a redrying plant at Mt. Sterling, Ky. This will require boilers, presses and other equipment.

The Mineral Development Company, Philadelphia, is reported to have purchased 20,000 acres of coal and timber lands in Letcher county, near Whitesburg, Ky., and to be planning the development of the property in the immediate future. Sawmills will be erected and later coal mines opened.

The Ohio River Contract Company, Evansville, Ind., which has a contract for the erection of a lock and dam at Henderson, Ky., on the Ohio River, will probably erect a planing mill to manufacture material to be used in the concrete forms for the walls of the lock.

The Kentucky Public Service Company, which recently took over the public utilities of Bowling Green and other Kentucky cities, is making improvements there. A contract had been let for a 1000-hp. turbogenerator and other equipment will be bought in the near future. T. Lindsey Fitch, Louisville, is vice-president of the company.

The Climax Roller Mills Company, Shelbyville, Ky., is in the market for a 50 to 75-hp. engine. L. D. Long is president of the company, which is erecting an addition to its mill.

The Russellville Milling Company, Russellville, Ky., is installing a plant for the manufacture of corn meal.

The Business Men's Club, Greenfield, Tenn., has arranged for the erection of a cotton gin to cost $8,000.

The Humboldt Water & Light Company, Humboldt, Tenn., is making some improvements in its power plant. An addition to the building is being erected. A contract for a 250-hp. boiler has already been let.

J. D. Rhea, Lynnville, Tenn., will erect a large two-stand cotton gin. Mr. Rhea now has four gins in operation. The new gin will have a capacity of 1000 bales a season.

Johnson City, Tenn., has sold its bond issue and is now ready to proceed with the construction of its water system. This will be operated by gravity and a large pipe line will be constructed from a lake several miles distant.

The Cliff Williams Machinery Company, Meridian, Miss., is planning to rebuild its shops which were recently burned, and is in the market for the following equipment, second hand preferred: One 36-in. Bullard boring mill and turret lathe combined; one lathe, 20 to 24-in. swing, 12 or 14 ft. long, prefer hollow spindle; one drill press; one pipe threading machine, 2½ to 6 in.; one power hack saw; one 15-hp. C. C. L. 220-volt, 3-phase, 60-cycle motor; one iron saw; one 25-hp. C. C. L. 220-volt, 3-phase, 60-cycle motor; one medium double surfacer, 6 x 20 in.; one woodworking lathe; one axle lathe; one 36-in. band saw; one wheel boxing machine; one square tennoning machine; one wheel tennoning machine; one self-feed rip saw; one drill press; one wood boring machine, multiple, about four spindles, one gaining machine and one knife grinder.

St. Matthews Produce Exchange, St. Matthews, Ky., is contemplating the establishment of a fertilizer plant and desires correspondence with manufacturers of all kinds of fertilizer machinery, mixers, grinders, crushers and machinery for grinding tobacco stems.

The Public Service Commission of Yazoo, Miss., will open bids April 27 for furnishing machinery and apparatus, including steam turbine driven, alternating current units, exciter units, railway converters, motor generator sets, condensers and other accessory apparatus.

The Common Council of Fort Pierce, Fla., will open bids April 16 for supplies for its waterworks, sewer and electric light systems, including one duplex pump, 750 gal. per min.; one duplex pump, 500 gal. per min.; 250-hp. boilers, one 100-k.v.a. A. C. generator; one 50-k.v.a. A. C. generator; seven miles of 6, 8, 10 and 12-in. sewer pipe, hydrants, gate valves, etc.

The Mallison Braided Cord Company, Athens, Ga., has placed orders for a large quantity of equipment in part to replace old equipment and to extend its capacity.

The Asheville Power & Light Company, Asheville, N. C., with $2,000,000 capital stock, has been chartered by H. H. Carr, H. P. Dalton and F. H. Briggs, of Raleigh, for the development of electric power in the western part of the state.

The Business Men's Club, Ridgely, Tenn., has closed a contract for the construction at that point of a $125,000 cotton seed oil mill, the work to begin immediately.

The Cawthorn Cotton Mills, Selma, Ala., which have been idle some years have been sold to J. F. Ames of Cleveland, Ohio, who will modernize the equipment and start operations.

St. Louis

ST. LOUIS, MO., April 1, 1912.

There seems to be a broadening tendency in the machine tool market, though the inquiries have not as yet approached a point where the business closed is greatly in excess of what has been the usual run. There have been no very large lists out the past week, nor in fact for months, save that of the Wabash Railroad, which has not yet been awarded because of the time required in figuring the proposals and because of the pressure for other equipment whose specifications have had to receive immediate attention. The dealers generally are becoming more encouraged over the outlook, and some increase in the inquiry for second-hand tools is helping this feeling.

The St. Louis County Gas Company, which supplies the suburban towns surrounding St. Louis, has refinanced with an increase of capital stock of $500,000 and an authorization of $30,000,000 in bonds for the purpose of increasing equipment and extending its service department over a greater area as business justifies.

The G. M. Boyd Brick & Tile Company, Knobnoster, Mo., has been incorporated with $175,000 capital stock by George M. William and John Boyd for the purpose of equipping a large plant on clay property owned by the incorporators.

The Chapman & Lennan Lead & Zinc Company, Webb City, Mo., has increased its capital stock from $100,000 to $300,000 for the purpose of extending its operations and increasing its equipment.

The Greene County Lumber Company, Springfield, Mo., has been incorporated by J. H. Hahn, T. T. Crenshaw, S. W. Tuttle, C. C. Sheppard and J. F. McSpadden for the purpose of operating mills which are to be equipped on property controlled by the incorporators.

The Wacissa Land & Phosphate Company, Batavia, Ill., has been incorporated with $60,000 capital stock by F. H. Beach, F. B Shearer and J. W. Raymond, and will install equipment for the development of properties owned by the stockholders.

The Hurst Automatic Switch & Signal Company, St. Louis, has purchased a large site on the western edge of St. Louis, and will put up a plant of which the first unit will cost about $250,000. The present plans are for the equipment of a force of 400 men, which will be increased to 1500 as soon as it can be developed.

The Donath Valve Gear Company, Windsor, Mo., has been incorporated with $10,000 capital stock by C. A. Donath, John Bowen and E. M. Phenix for the equipment of a factory for the manufacture of special valve gears.

The Tellhausen-Allen Mfg. Company, St. Louis, has increased its capital stock from $25,000 to $100,000 for the purpose of extending its manufacturing equipment.

The Penter-Dowden Mfg. Company, Columbia, Mo., has increased its capital stock from $10,000 to $20,000 for

the purpose of increasing its mechanical equipment.

The Farmers' Elevator Company, Dwight, Ill., has been incorporated with $15,000 capital stock by Martin Hoffman, George J. Steichen and John Schrotberger for the purpose of equipping a grain elevator at that point.

The Hollar Acetylene Gas Machine Company, Tonica, Ill., has been incorporated with $15,000 capital stock by G. W. Hartenbower, G. M. Reynolds and John B. Hollar to equip a plant for the manufacture of a new acetylene gas machine.

The Shaw Garden trustees of St. Louis have completed plans for the construction of a large boiler house and the comprehensive extension of the heating plant for its greenhouses involving the expenditure of about $127,000.

The Light, Power & Mfg. Company, Willow Springs, Mo., has been incorporated with $20,000 capital stock by W. T. Wright, W. Bucklow, E. M. Rollins, B. F. Thomas, J. C. Dyott and B. M. Grant to establish a plant to supply electricity under a public service franchise.

The Severance Tank & Silo Company, Lansing, Mich., has completed arrangements to build a branch factory in East St. Louis, Ill., with equipment for the manufacture of metal silos and water tanks.

The Terre Bonne Sugar Company, Houma, La., has bought the Lower Terre Bonne Refining & Mfg. Company's plant from F. B. Williams and will overhaul, remodel and otherwise fit the plant for operation.

The Louisiana State Rice Milling Company, New Orleans, La., has absorbed the National Rice Milling Company, and instead of building new plants will overhaul and enlarge the latter company's plants.

The Montgomery City, Mo., electric light plant has been sold to E. H. Algermissen of Jonesburg, Mo., who will improve it and operate it under a public service franchise.

The American Paper Products Company, St. Louis, has appropriated $10,000 for the enlargement of its mechanical capacity.

The Valler & Spies Milling Company, St. Louis, has completed the purchase of a site of 370 ft. front for the construction thereon of a large concrete elevator with modern equipment.

The Bonner Miller Mfg. Company, St. Louis, has been incorporated with $100,000 capital stock by Bonner Miller, J. A. Lewis and J. W. Bell.

The Dyatt-Wheeler-Baker Mfg. Company, East St. Louis, Ill., has been incorporated by V. E. Dyatt, H. M. Dyatt and W. L. Dyatt for the manufacture of hardware specialties in a plant to be equipped by the company.

The Joy Prairie Farmers' Elevator Company, Joy Prairie, Ill., has been incorporated with $17,000 capital stock by John Hadden, F. J. Blackburn and A. E. Williamson to build and equip a grain elevator.

Texas

AUSTIN, TEXAS, March 30, 1912.

Prospects are favorable for an unusual amount of railroad construction during the present year, and this will cause a considerable demand for steel, bridge material and various other kinds of iron and steel products that enter into such work. Contracts have already been signed and work is in progress on lines which involve the construction of approximately 1000 miles of new road. Much work is being done in constructing drainage and irrigation systems. There is also a good demand for various kinds of small tools.

The Moore's Bluff Corporation, Houston, which was recently organized with a capital stock of $250,000, will construct a large system of irrigation in Liberty county. The incorporators are Neils Esperson and F. R. Reese of Houston and J. E. Fields of Blackwell, Okla.; Jesse Brown of Humble, and A. C. White of Dayton.

The City Commission has under consideration the proposition of establishing a municipal abattaoir at Austin at a cost of about $25,000.

J. E. Kenisell has been investigating the clay resources of the section near Bay City, with a view of establishing brick and pottery works.

The Price-Booker Company, formerly of San Antonio, has acquired a property at Houston Heights, into which it will move with the expectation of operating within two or three weeks.

The Quality Granite Works, which was recently organized at Llano, will install a plant for cutting and polishing granite. Hydraulic air drills, polishing and cutting machinery and elevators will be installed. C. E. Barney of Llano is president and P. A. Beiter is general manager.

W. E. Shell & Co. are installing an electric light and power plant at Port Lavaca.

The Waco Coca-Cola Bottling Company, Waco, has been formed with a capital stock of $21,000. The incorporators are H. E. Kelly, J. E. Echols and C. I. Taylor.

The Morey-Faulhaber Construction Company, Austin, has been organized with a capital stock of $5,000. The incorporators are Richard Morey, E. A. Faulhaber, Frank Donze and others.

The Port Lavaca Mfg. Company, Port Lavaca, has been formed with a capital stock of $50,000. The incorporators are George Herder, Jr., J. O. Boetcher and F. F. Anders.

The Boyce Oil & Development Company, Boyce, has been organized with a capital stock of $60,000. It will carry on oil development operations. The incorporators are W. W. Sharp, C. A. Sharp and J. T. Smith.

The Holloway Mountain Oil & Gas Company is preparing to bore wells for oil and gas in the Holloway Mountains near Coleman. J. C. Dribell is president.

The city of Paris, Texas, will receive bids until April 9 for furnishing and operating a pumping plant for two deep wells.

The Wiggins Sub-Irrigated Land Company, which was recently organized with a capital stock of $50,000, is preparing to construct a large system of irrigation near Farmington. John L. Wiggins is manager.

The Tamalina Milling Company is erecting a grist mill at San Antonio. It will cost about $25,000. The officers are D. Martinez, president; F. A. Chapa, vice-president; W. Martinez, secretary; F. Larvodoe, treasurer.

The Floresville Ice & Power Company, Floresville, has been organized with a capital stock of $1,650,000. The incorporators are W. G. E. Rolaff, Richard Wolfsky and Yale Hicks.

The Webb Oil Company, Humble, has been organized with a capital stock of $10,000. The incorporators are J. E. Webb, C. L. Kaiser and J. H. Nie.

The taxpayers of Nacogdoches, have just voted favorably on the proposition of issuing $65,000 of bonds for the installation of an electric light plant, the construction of a sewer system and street paving.

The city of Terrell will make improvements to the waterworks plant at a cost of $25,000. It will also soon issue bonds for constructing a sewer system.

L. A. Deen, of Spencer, Ind., contemplates installing a plant at Palestine, Texas, for the manufacture of spokes and wagon wheels.

The Water Commission of Waco is formulating plans for installing a large pumping and filtration plant.

The Sweetwater Rice Company, Sweetwater, has been organized with a capital stock of $50,000. Incorporators are W. G. Swenson, W. J. Fulwiller and L. L. Stevenson.

The city of Nogales, Ariz., will make improvements to the waterworks plant and distributing system which it recently purchased from the Nogales Water Company for $60,000.

D. A. Layne and W. D. Murray of Silver City, N. M., will install an electric light and power plant and an ice factory at Lordsburg, N. M. They will run power transmission lines from the electric plant to the Shakespere mining district. Robert E. Cameron is manager of the new project.

W. D. Ellis and Cyrus Ellis will erect a cotton gin at Candlish, Texas.

The Huasteca Petroleum Company of Tampico, Mexico, and Los Angeles, Cal., will soon begin the construction of an oil pipe line from the Juan Casiano oil field, near Tampico, to Mexico City, a distance of about 500 miles. Several pumping stations will be installed at points on the proposed line.

The Federal Light & Traction Company of New York has just closed a deal for the purchase of the properties of the Deming Ice & Electric Company at Deming, N. M. It is announced by the purchasing company that it will install additional electrical equipment to the plant and extend the power transmission system to a number of new points in the Mimbres valley. The power furnished by this plant is used chiefly for the operation of irrigation pumping plants.

The Federal Government of Mexico has extended the time in which Johanssen Felix & Co. shall begin the erection of a plant for the manufacture of zinc into ingots, sheets and other forms. This company obtained a concession from the government for this proposed manufacturing plant some time ago.

Ernesto F. Ayton of Mexico City and associates will install a large hydroelectric plant near Guanacevi, state of Durango, Mexico, and construct a system of power transmission lines to towns and mining camps of that section. They will utilize the water of the Guanacevi River for the purpose of generating initial energy. Mr. Ayton has applied to the federal government for a concession for the proposed enterprise.

ber, are at work on the new building. In addition to manufacturing sash and doors, the company will make all kinds of interior finish.

The Land & Finance Corporation of British Columbia, Ltd., Vancouver, B. C., has been incorporated, with a capital stock of $2,500,000, to build and operate railways, bridges, tramways, sawmills, planing mills, etc.

C. B. Pride, of Wisconsin, was recently in Nelson, B. C., interviewing the town authorities for the purpose of securing a site and cheap power to operate a paper and pulp mill there.

Work has been started by Skeene & Christie, contractors, on the six-story laundry and power house, representing part of the improvements planned for the Hotel Vancouver, at Vancouver, B. C.

The British Canadian Canners, Ltd., have awarded a contract for the construction of a large canning plant, to cost $30,000, at Port Robinson, Ont. Considerable machinery and cooking and canning equipment will be installed.

The Napanee Iron Works, Ltd., Napanee, Ont., recently incorporated with a capital stock of $200,000, will take over the business of the Dominion Rock Drill Company, Ltd. An extensive plant, including foundry, machine shop, boiler shop, etc., will be built of brick and steel construction for the manufacture of rock drills, derricks and hoists, dump cars and contractors' supplies. Plant equipment required consists of foundry cupola, ladles, etc.; boiler shop and machine shop machinery and tools.

Welland county, Ont., is in the market for road making machinery, including two large road graders, 18-hp. road engine, two 10-ton steam rollers, two portable rock crushers and two 25-ton portable bins for stone storage, two revolving screens, two chain elevators and two sprinkling wagons. Robert Cooper, County Clerk, Welland, Ont., is receiving bids.

Government Purchases

WASHINGTON, D. C., April 1, 1912.

The United States Marine Corps depot of supplies, Philadelphia, Pa., will open bids April 11 for furnishing and installing one electric power unit.

The Paymaster-General, Navy Department, Washington, will open bids April 23, under schedule 4436, class 101, for one automatic railway motor-driven cut-off saw with iron table.

The Bureau of Supplies and Accounts, Navy Department, Washington, will open bids April 30 for supplies for the navy yards as follows: Laundry machinery for Mare Island, Cal., Schedule 4446; two ventilating motors for Philadelphia, Pa., schedule 4459; 12 ventilating sets for Brooklyn, N. Y., schedule 4449; two ventilating sets for Puget Sound, Wash., schedule 4459; and one power gap shear for Norfolk, Va., under schedule 4458.

The Bureau of Supplies and Accounts, Navy Department, Washington, opened bids March 26 under schedule 4385, class 111, for three turbo generating sets as follows: Bidder 13, General Electric Company, Schenectady, N. Y., $8,168; 44, Terry Steam Turbine Company, New York, $12,314; 59, Kerr Turbine Company, Wellsville, N. Y., $8,575.

Trade Publications

Fire Extinguishers.—Mogul Fire Extinguisher Company, Cincinnati, Ohio. Catalogue. Calls attention to the Mogul No. 50 fire extinguisher which is designed for factory use. The importance of protection against fire is briefly touched upon and this is followed by photographs of a test made of the extinguisher. The special features of this appliance are an hermetically sealed acid receptacle, a very strong tank and a fsafety by-pass. All of these features are described together with the construction of the other parts of the extinguisher.

Silent Chain.—Morse Chain Company, Ithaca, N. Y. Bulletin No. 11. Explains the design and operation of the Morse silent-running high speed chains. A number of engravings showing these chains in operation are given together with a comparison of the costs of rope and chain drives for rolling mill work.

Blow-Off Valves.—Nelson Valve Company, Chestnut Hill, Philadelphia, Pa. Mailing card. Treats of the feature of protection to packing found in tne blow-off valves made by this company. Views showing the closed position of the valve in which the lower packing is below the inlet port and the open position in which the lower packing is above the inlet port are included.

High Pressure Valves.—Kelly & Jones Company, Greensburg, Pa. Booklet. Illustrates and describes the K. & J. Excelsior regrinding brass valves which are made in the globe, angle and cross patterns with either screwed or flanged ends for pressures of 200 and 300 lb. These valves are all illustrated together with priced tables of the various sizes in which they are made. Illustrated tables of repair parts are also included.

Washers.—Bettcher Mfg. Company, Cleveland, Ohio. Catalogue. Size, 6¾ x 4½ in.; pages, 24. Gives tables of sizes and prices of the company's complete line of washers including standard wrought, special size, standard carriage, thin steel, square, light steel, axle, engine, foundation bolt, sheet copper and sheet brass washers. The company manufactures washers of any material or any fibre or box board from ¼ to 20 in. in diameter and from 0.002 to 0.875 in. thick. The catalogue contains a number of illustrations and among the other products listed are annealed riveting bars, steel felloe plates, ladder jacks, corrugated copper gaskets, sheet metal stampings and bedstead grommets.

Electric Motors.—Ideal Electric & Mfg. Company, Mansfield, Ohio. Bulletin No. 1011. Illustrates and describes the type H Ideal direct-current motor and generator. These motors are characterized by a compact mechanical design, a highly perfected system of ventilation, large bearing surfaces, low current density, low armature reaction and ready accessibility of all parts for inspection. The construction of these machines is gone into at some length and the text is supplemented by numerous illustrations. Reproductions of test curves, showing a good efficiency over a wide range of load for a 50-kw. generator 10-hp. motor are included. These motors and generators can be furnished in any size from ½ to 500 hp. in the motors and from ½ to 500 kw. in the generators. They are wound for any of the standard voltages, and can be had with either shunt or compound windings.

Emergency Medical Case.—H. C. Cragg Mfg. Co., 228 K street, S. W., Washington, D. C. Folder. Treats of a germ proof emergency medical case which was stamped from sheet metal with dies of the company's own manufacture. This case is made entirely of white metal and is arranged for a full emergency outfit, including bandages, needles, medicine bottles, etc. This case has been furnished the Medical Department of the United States Army and is also equally well adapted for use in factories and industrial establishments. Halftone reproductions of dies made by this firm and some of the products of its factory are included.

Jacks.—Duff-Bethlehem Company, Pittsburgh, Pa. Folder. Treats of the various types of Duff-Bethlehem hydraulic jack which this company builds. One of the special features of the jacks is the small number of packings employed.

Grinding Machines and Wheels.—Brown & Sharpe Mfg. Company, Providence, R. I. Six pamphlets. Relate to various features concerning grinding wheels and grinding machines such as the points to be considered in the selection of grinding wheels, the value of rigid machine tool construction in grinding machines, the advantages of independent speeds and feeds in grinding machines, how accurate grinding is largely due to the alignment of the machine and the features that adapt this company's machines to commercial grinding. The last pamphlet which is entitled "In the Shops Where B. & S. Grinding Machines Are Built" contains a description of the company's plant and shows the successive stages in the construction of one of these machines. All the pamphlets contain valuable information about the grinding process and the devices employed in connection with it and the text is supplemented by numerous engravings.

Cutting-off Machines.—Holton Company, Jackson, Mich. Folder. Calls attention to a cutting-off machine for gas pipe, tubing or small bar steel. The ends are left square and true and the hole is free from burrs or obstructions on the inside and consequently does not require any reaming. It is claimed for this machine that it will cut pipe or tubing to any length as accurately as the rotary cutter commonly employed.

Battery Truck Crane.—General Electric Company, Schenectady, N. Y. Bulletin No. 4892. Contains illustrations of a battery truck and crane in use which was illustrated in *The Iron Age*, November 30, 1911, and describes the various pieces of apparatus used in connection with it. The machine is a short heavy storage battery vehicle with a swinging crane mounted on its forward end. The vehicle is used for loading, hauling and unloading trailers, loading and unloading cars, hoisting and carrying boxes or barrels and for stacking.

Pipe Cutting and Threading Machinery.—Standard Machinery Company, Ellwood City, Pa. Catalogue. Illustrations and descriptive matter explain the operation of a line of pipe cutting and threading machinery which is built for handling pipes ranging in diameter from 4 to 20 in., these dimensions being the maximum sizes handled by the smallest and the largest machines built. To care for intermediate diameters adjustable expanding chasers are furnished. A number of spindle speeds are available and these are secured by employing a set of change gears.

Pumps and Condensers.—Dean Brothers Steam Pump Works, Indianapolis, Ind. Pony catalogue No. 86. Deals with a line of pumps for various kinds of service and combination air pumps and condensers which are built in both the vertical and horizontal styles.

Gas Furnace.—Auto Radiator & Fender Company, 229 Dolphin street, Baltimore, Md. Circular. Relates to the EI-D Gas Saver furnace which is simple in construction, occupies a small space and is said to consume a small quantity of gas and produce a high temperature.